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The AUTOMOBILE

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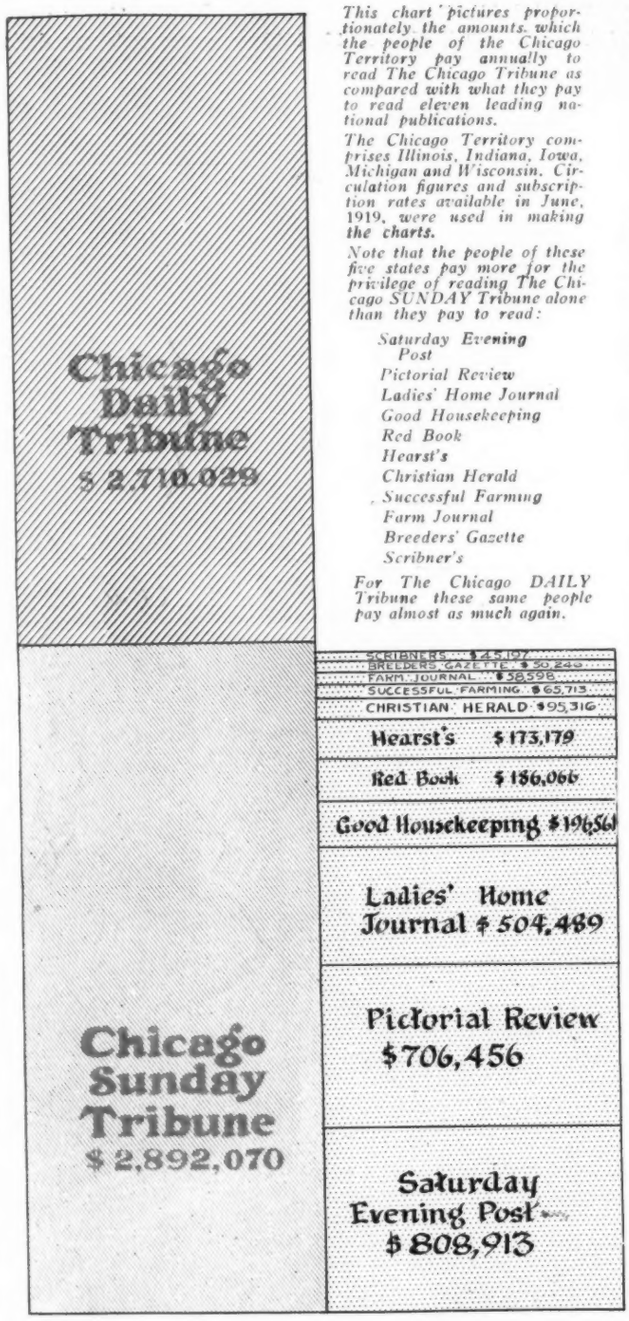
The Chicago Tribune

THE WORLD'S GREATEST NEWSPAPER

Dominates in Five Great States as Medium for "National" Advertising



This chart pictures proportionately the amounts which the people of the Chicago Territory pay annually to read The Chicago Tribune as compared with what they pay to read eleven leading national publications.

The Chicago Territory comprises Illinois, Indiana, Iowa, Michigan and Wisconsin. Circulation figures and subscription rates available in June, 1919, were used in making the charts.

Note that the people of these five states pay more for the privilege of reading The Chicago SUNDAY Tribune alone than they pay to read:

Saturday Evening Post
Pictorial Review
Ladies' Home Journal
Good Housekeeping
Red Book
Hearst's
Christian Herald
Successful Farming
Farm Journal
Breeders' Gazette
Scribner's

For The Chicago DAILY Tribune these same people pay almost as much again.

Mr. William H. Johns, speaking as President of the American Association of Advertising Agencies, recently said:

"The newspaper has such a quick, direct appeal to the public that it is destined to be more and more recognized as the biggest, most essential and thoroughly recognized factor in national as well as local advertising, just as all concede today that even the smallest local newspaper helps frame national opinion on matters of politics, morale, tastes and habits."

Obviously, it is important that *every man who spends money for advertising* should realize the unique dominance of The Chicago Tribune in its territory as a medium for "NATIONAL" advertising.

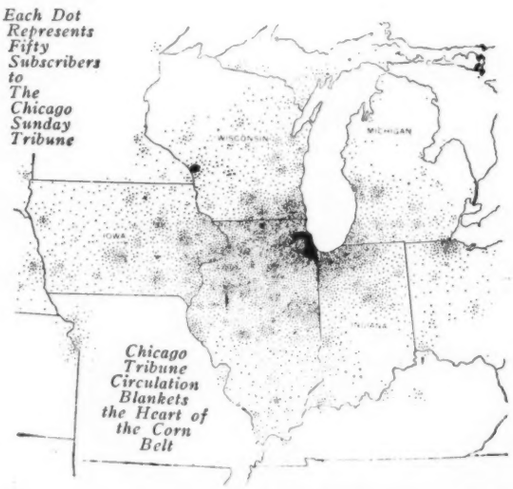
The map below shows how thoroughly The Chicago Tribune covers five great states. The chart opposite indicates that The Chicago Tribune must be a powerful force—an unrivaled force—with its readers, since they pay twice as much for the privilege of reading it as the sixteen million five hundred thousand inhabitants of the same five states pay to read eleven leading weekly, monthly, women's and farmers' magazines.

The value of a publication to a reader, its importance in his daily life, its weight and influence with him—is surely to be measured by what the reader pays for it. When people pay $10.00 a year (cash in advance) for The Chicago Tribune, it is because they *want* The Tribune *more than anything else they read.*

The hundreds of thousands of people graphically pictured on the map below awake 365 mornings in the year with two ideas linked by the rigid routine of a lifetime—*breakfast and The Chicago Tribune.*

Magazines may be laid away to be read *whenever leisure and inclination happen to coincide,* but a part of *every* day is *definitely set aside* for reading The Chicago Tribune. Through no other medium can an advertiser so *swiftly,* so *surely,* so *directly* reach the hearts and the brains and the pocketbooks of the people of the Chicago Territory.

In the Chicago territory one-sixth of the population of the United States possesses one-fifth of the national wealth, raises one-fifth of all our crops and produces one-fifth of our total manufactured product. The Chicago territory is unquestionably the world's most desirable market, and it is dominated from an advertising standpoint by the world's greatest newspaper—The Chicago Tribune—circulation now in excess of 400,000 Daily and 700,000 Sunday.



"Iowa," a booklet giving a vivid picture of one section of the Chicago market will be sent Free to any selling organization if requested on business stationery.

AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

Vol. XLI NEW YORK, NOVEMBER 20, 1919 No. 21

A Bill to Create a Department of Aeronautics

Washington sentiment is crystalizing to the idea of a department of Aeronautics as the solution of the present problem of developing from the war experiments a means of civilian benefit. To aid in bringing this sentiment to a focus, we print here the draft of a bill to create such a department. This is founded on criticisms of existing plans and is submitted as a basis of discussion

By Allen Sinsheimer

THAT a healthy, prosperous aeronautic industry in this country must be properly nurtured and carefully developed to full growth and cannot be manufactured over night, is becoming more and more the opinion of officials here. Likewise the view is widely accepted that military, naval and postal aeronautics, for example, are widely different from general commercial aeronautics and that they cannot be combined, under one head or one department for operation and training, so that commercial aeronautics will be certain to receive the attention it should have.

It is pointed out that what is needed more than anything else is the development of commercial aviation which will insure both prosperity and ample military defense in this country, and commercial aviation it is said must be given the same foundation as was the automobile industry. Automobiles have never been successfully sold where there were no roads, service stations or gasoline supplies.

True, the automobile came before good roads, but it was first successful in the cities because of the better city highways, and it did not become a universal vehicle in this country until the roads were improved. Every manufacturer appreciates the fact that the new bills which provide for still better roads will mean greater sales of automobiles. Likewise they understand that service stations in their community mean greater prosperity to the automobile industry.

In the same manner it is asserted that the aircraft industry must be given the foundation of numerous landing fields, meteorological stations, aerial routes, protective laws, etc., before aviation can become popular. This will be more important to the prosperity and healthful growth of the aeronautics than the hurried purchase by the Government of thousands of airplanes. The latter would be an attempt to make the industry over night, and would be building without a foundation. The former method insures first the foundation and allows for all forms of development to follow.

It has also been pointed out recently that a Department of Aeronautics which would include military and naval aeronautic operations and training would be inclined to become almost entirely military and neglectful of the commercial requirements of the country. Such a department would probably devote most of its energies to the design of military, naval and postal planes, and

these, it is pointed out, are radically different from each other and from what should become the standard commercial types.

Military aeronautics, for example, require an airplane that can elude the pursuer or chase the enemy from one height to another in tail spins or Immelmanns, etc., whereas commercial planes should be considered only with a view to stability and should be physically unable to perform stunts. Again, postal planes must be designed especially for post office service and naval flying boats so that they can properly co-operate with all naval maneuvers. Naval fliers must be versed in naval tactics. Military fliers must be versed in all military tactics and be capable of performing all of the necessary stunts.

These views indicate, it will be noted, the tendency of opinion here toward the suggestions made previously in these columns for a department of aeronautics which would have complete control of all aviation in the United States but not of operation or training, and which would be composed of a director, assistant director, advisory board and several sub-departments. In fact, all activities here recently indicate that the various departments are desirous of achieving some such policy on the part of the Government and are working rapidly toward that end.

One suggestion which has been made as an addition to the department plan published in AUTOMOTIVE INDUSTRIES of Sept. 5 by the General Staff of the Army is of sufficient value to be included. This is the suggestion for a production and procurement division, a department which would have charge of production and the procurement of planes for all Government departments, as specified by each individual department. The procurement division would be a bureau in the Department of Aeronautics and its chief object would be to insure even distribution of Government contracts and to prevent competition between Government departments, as well as to co-operate with the manufacturers in the production of planes.

A Basis for Discussion

As a result of the suggestions by the various departments and persons interested, indicating that the previous suggestion for a Department of Aeronautics as outlined in these columns is approved, the following bill has been compiled and it is printed here as a basis for further discussion. A bill similar to this will undoubtedly be introduced in the next session of Congress. The writer, in presenting this bill, wishes to acknowledge aid from various sources:

To create a Department of Aeronautics, providing for its organization, defining the powers and duties of the Director thereof, providing for the development and regulation of civil and commercial aviation and development of military and naval aviation.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled:

That there is hereby created an executive department in the Government to be called the Department of Aeronautics, and a Director of Aeronautics shall be the head thereof, and shall be appointed by the President by and with the advice and consent of the Senate, who shall receive a salary of $12,000 per annum and whose term of office shall be like that of the heads of other executive departments. Section 158 of the Revised Statutes is hereby amended to include such a Department of Aeronautics, and the provisions of title 4 of the Revised Statutes including all amendments thereto are hereby made applicable to said department.

The said Director shall cause a seal of office to be made for the Department of Aeronautics to be approved by the President and judicial notice shall be taken of the seal.

SEC. 2. That there shall be an Advisory Board on Aeronautics comprising one representative each from the departments of Agriculture, Commerce, Post Office, War, State, Navy and Treasury. The Director of Aeronautics shall be chairman of the said Advisory Board, which shall as a Board be purely advisory and without executive powers, except as hereinafter provided.

SEC. 3. That there shall be in said department an Assistant Director of Aeronautics to be appointed by the President, who shall receive a salary of $6,000 per annum. The duties of the Assistant Director of Aeronautics shall be prescribed by the Director of Aeronautics or may be required by law. There shall also be other clerical assistants, inventors, inspectors, experts, scientists and special agents as may be required from time to time and authorized by the Director of Aeronautics. Until Congress enacts laws creating an auditor for the Department of Aeronautics, the auditor for the State and other departments shall receive and examine all accounts of salaries and incidental expenses of the office of the Director of Aeronautics and of all bureaus and offices under his direction and all accounts relating to other business within the jurisdiction of the Department of Aeronautics and shall certify the balances arising thereon to the Division of Bookkeeping and Accounting of the Treasury Department, sending a copy of each such certificate to the Department of Aeronautics.

Duties of the Department

SEC. 4. That it shall be the province and duty of said Department of Aeronautics except as may be hereinafter provided, to foster, develop and promote all matters pertaining to aeronautics, including the collection and dissemination of information relating thereto, and shall be charged with the purchase and inspection of all aircraft for the United States, including the War, Post Office, Navy and Treasury Departments or any other departments of the Government except as may be hereinafter provided in times of peace and war, the establishment of aerial routes throughout the United States, the compilation and publication of aerial maps, inspection of all types of aircraft and the issuance of licenses for the same, the regulation and control of signals and all methods of communication directly relating to aeronautics, supervision and establishment of landing fields, including supervision of those used for private or commercial purposes, development of meteorology and preparation and distribution of meteorological data, development and regulation of aeronautic insurance, maintenance of flying records, establishment of laboratories for aeronautic research and development of heavier and lighter than air aeronautic material, testing of flying fields and signals, and all methods of aeronautic communication, establishment of marking standards for fields and aircraft, responsibility for standards, laws, operation and customs of international aeronautics as related to the United States, the promulgation of rules and regulations for international, interstate and intrastate flying.

SEC. 5. That the Department of Aeronautics shall not train pilots nor operate any or all aircraft except in the natural fulfillment of its duties as outlined herein. It shall not take over the aeronautic operations of the Post Office, War or Navy Departments or any other Government departments as outlined herein.

SEC. 6. That the Director of Aeronautics shall establish a Procurement Division, the head of which shall be a civilian appointed by the Director of Aeronautics. The Procurement Division shall purchase and have complete charge of production

of aircraft for all Government departments, including the Post Office, War and Navy Departments and any other Government department as may be directed from time to time by said department, according to specifications presented by said department. That all sums of money to be appropriated by Congress for the development of aeronautics, either for expenditure by the Department of Aeronautics or by any other Government department, shall be requested of Congress by the Director of Aeronautics, which shall secure estimates from the Post Office, War, Navy and other Government departments operating and controlling aircraft and shall combine such estimates together with necessary estimates for the Department of Aeronautics. Said appropriations when authorized by Congress and received by the Director of Aeronautics shall be apportioned to the Department of Aeronautics, the Post Office, War and Navy Departments and any other Government departments on the basis of the estimates rendered by each to the Director of Aeronautics and in the same proportion as those estimates bear to the total appropriation requested.

Emergency Control

SEC. 7. That at the direction of the President the Director of Aeronautics shall in times of national emergency be given complete control of the aircraft resources of all and any Government departments, and shall assign the aircraft resources to the War and Navy Departments in aeronautical units computed upon the basis of the prevailing size and disposition of the military and naval establishments. The tactical employment of all such units while so assigned shall be under exclusive control of appropriate military or naval commanders, and the personnel of all such units while so assigned shall be subject to the disciplinary laws and regulations governing the branch of the service to which said unit shall have been assigned.

SEC. 8. That each and every function, authority, power, duty and jurisdiction of whatsoever character in so far as it relates to these duties of the Department of Aeronautics as outlined herein vested at the time of passage of this Act, in any corps, office, bureau, division or other office of the Government is transferred and becomes immediately and hereafter vested in the Director of Aeronautics.

SEC. 9. That all land, buildings, furniture, apparatus, equipment, property of whatsoever description and all official records and papers in custody of any executive department and required by the Director of Aeronautics in the fulfillment of his duties as outlined herein is transferred as promptly as such action can be taken without hindering the work of the executive department from which said transfer is made.

SEC. 10. That the Director of Aeronautics shall be allowed to expend for the purchase of land, buildings, machinery, vehicles, vessels and apparatus required for the operations of the Department of Aeronautics in promoting, developing and regulating the navigation of the air and for periodicals and for the purpose of the library and for rental of proper quarters for the accommodation of a Department of Aeronautics within the District of Columbia and for all other incidental expenses such sums as Congress may provide from time to time.

SEC. 11. That subject to the approval of the Director of Aeronautics all civilian employees of the War, Navy, Treasury, Post Office Departments or other Bureau, office, department or branch of the public service engaged or on duty exclusively pertaining to aeronautics whose duties shall hereafter be a part of the Department of Aeronautics shall be and are hereby transferred to the Department of Aeronautics at their present grades and salaries.

SEC. 12. That the organization of a Department of Aeronautics shall consist of a Director of Aeronautics and an Assistant Director of Aeronautics and that there shall be in addition to the Procurement Division, already specified herein, four or more divisions to be known as:

Division of Civil Aviation, the head of which shall be a civilian appointed by the Director of Aeronautics, and who shall be in charge of the establishment and development of aerial routes, compilation and distribution of aerial maps, issuance of pilot licenses, establishment of signals and communication, supervision of landing fields, compilation and dissemination of meteorological data, promulgation of Federal laws, supervision of aeronautic insurance and maintenance of flying records.

Division of Technical Aviation, the head of which shall be a civilian appointed by the Director of Aeronautics, and who shall direct the research laboratories, the inspection of aircraft for airworthiness, the testing of landing fields, co-operation with the aircraft industry and technical societies, signal and communication devices, marking standards, compilation and dissemination of technical data, and the establishment of all regulations pertaining to safety either on fields or in the air.

Division of International Aeronautics, the head of which shall be a civilian appointed by the Director of Aeronautics, and who shall be in charge of the establishment of standards relating to international flights, and establishment of regulations pertaining to customs duties and who shall act as a representative of the United States in all matters relating to international aeronautics as defined in the Covenant of the League of Nations.

Division of Finance and Personnel, the head of which shall be a civilian appointed by the Director of Aeronautics, and who shall have charge of the finances and personnel of the Department of Aeronautics.

SEC. 13. That the Director of Aeronautics is authorized and directed to establish aerial routes throughout the United States and its possessions, and to this end shall co-operate with the various states, cities and municipalities for the purpose of immediately setting aside and establishing airdromes and landing fields to be used in common by Federal, State, municipal, commercial and private aircraft under such regulations as may be prescribed by the Department of Aeronautics.

SEC. 14. Until June 30, 1926, the Government will furnish at cost to any owner of private or commercial aircraft landing on an airdrome of the Air Force, airplane gasoline, airplane oil and other supplies, including mechanical assistance, under such regulations as may be prescribed by the Department of Aeronautics.

Co-operation with Other Departments

SEC. 15. That the Director of Aeronautics is authorized and directed to co-operate with every civil department of the Government of the United States, including the Post Office, Treasury, Coast and Geodetic Survey, Geological Survey, Forestry Service and Bureau of Fisheries in order to properly execute their aerial requirements, and to this end the said Director of Aeronautics is authorized to employ, in addition, such civilian personnel as he may deem necessary.

SEC. 16. Provided, however, that nothing herein contained shall be construed to prevent the maintenance and operation of air service by the War Department, Navy Department and Post Office Department adequate for the fulfillment of their functions as defined by existing laws.

SEC. 17. That nothing herein contained shall be construed to prevent the maintenance and operation of the War, Navy and Post Office Departments of organization adequate for the preparation of general specifications, general plans and characteristics of aviation mechanisms, accessories and equipment required for military, naval or postal aeronautic purposes.

SEC. 18. That nothing contained herein shall be construed to prohibit the maintenance by the War, Naval or Postal Departments of organizations adequate for technical development and experimentation with aviation mechanisms, accessories and equipment adapted to the peculiar requirements of each

(*Continued on Page* 1033)

British Adaptation of Starting and Lighting Equipment

The Olympia show has revealed to what extent the British car makers have adopted the American idea of lighting and starting equipment. Mr. Hutton, an English writer of automotive books, has prepared the following analysis of the equipment in the 1920 cars. He points out the similar and different practices and in a measure explains the differences. Also he describes some of the new designs

By F. H. Hutton.

AS REGARDS the electrical equipment of British cars for 1920, the outstanding fact is that for the first time electric lighting and starting is practically universal; but for an endeavor to produce a light and low priced two-seater in certain cases, probably no car would have been planned without a complete electric equipment.

If no radical change is to be seen in the design of lighting and starting sets as fitted to some of the more advanced pre-war cars, the improvements effected in essential details and in workmanship are very marked. Many of the changes are in the direction of simplifying the design and in eliminating unnecessary wiring, and it must be remarked that the average British lay-out now compares favorably with the average American in regard to simplicity.

On the question of voltage there is a remarkable unanimity, for 12 volts may be regarded as standard for medium and large sets, while some electrical equipment manufacturers also provide a six-volt set for use on the small two-seater cars.

It is not easy to say why this higher voltage has become standardized in place of the six volts so common in America; probably, it was a case of following precedents, one or two of the earliest makers having started with 12 volts, the later ones followed suit.

Very much the same conditions exist with regard to the question of two units versus the combined system for lighting and starting. The two-unit system is generally adopted but the makers in many cases also list a dynamotor for small two-seater cars. This is generally done on the ground of reducing the cost, but consideration is also given to the fact that in the small sized dynamotor the momentum of the armature, which must necessarily be geared up considerably, is not so excessive as in the larger sizes.

With regard to output control the well-known third-brush system is generally used and seems to be entirely satisfactory; it has the merit of simplicity, and furnishes a convenient means of altering the rated output. One or two firms, however, make use of the principle of cross magnetization of the armature with quite satisfactory results. The mechanical system, in which the speed of the armature is kept constant by means of a slipping clutch, still has one or two adherents. The amount of the slip is regulated by a centrifugal governor and the friction surface of the clutch is faced with asbestos fabric or similar material. Although the principle does not appeal to engineers, the results obtained appear to be quite good as regards regulation; nor does the heat generated by the slipping clutch seem to be excessive. By this method the armature is at least relieved of stresses due to abnormal speeds, and the dynamo is plain shunt-wound machine.

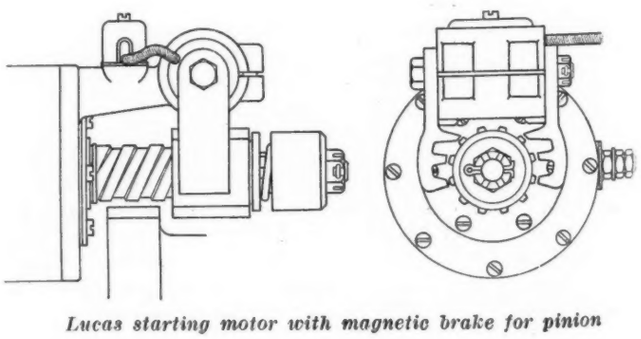
Nearly all the dynamos are now of a plain cylindrical shape externally and held in place by one or more metal straps.

Switchboard arrangement has been improved a good deal. In place of the large box-like affairs of a few years ago, with a collection of separate miniature tumbler switches and instruments, neat aluminum cases are found, small and well finished, fitting snugly into the instrument board. The switches themselves are a more robust type, which is a very important point; often there are only three, one for charging, one for head and tail lamp, and one for side and tail lamps.

In one lighting set no separate charging switch is provided, the makers arguing that it is a better arrangement, as otherwise some charging time is often lost owing to the driver forgetting to switch on. In the majority of cases this may be so, but, on cars constantly making long runs in the country, overcharging might result occasionally. (Such a switch is never used in this country, or at least only in rare instances.—Editor.)

An automatic cut-out of the ordinary shunt and series wound type is generally placed in the switchboard and seems the best possible arrangement, giving no trouble as a rule; but one well-known firm still keeps to the alternative plan of employing a free-wheel or over-running clutch on the dynamo.

Insulated return wiring is almost universally used on British cars, but here again it is more due to simian propensities on the part of manufacturers than to the actual merits of the case. A prejudice seems to have been established in England



Lucas starting motor with magnetic brake for pinion

against single-pole wiring, through some of the early installations of this kind having their "ground" connections badly made.

Ground return wiring, if properly carried out, as any form of wiring should be, is quite satisfactory; moreover, it helps to simplify the layout and gives more room for insulation in places where it is badly wanted, such as lamp holders. Lampholders, in fact, are among the accessories in which considerable improvement is called for. Being so small, all the parts have to be cut down fine, and, if the workmanship is not of the best, faults often occur: the lamp bulb is not held up to the contacts firmly, the insulation gives way and causes a short circuit, the plungers stick, or the springs lose their temper from the heat generated by the current passing through them.

There has been a good deal of much needed improvement in the manner of taking the leads to the headlamps and in making the connections to them. One of the best solutions appears to be to make the headlamp bracket tubular and run the leads inside this tube to terminals placed between the outside shell of the lamp body and the back of the reflector, where they are well protected and out of the way. In another design the leads are kept outside in the usual way but are taken up to a neat form of socket which is combined with one of the lugs at the side of the lamp, thus avoiding the usual bend in the cable at the back of the lamp, which always forms a weak spot.

There is also to be seen much progress in the manner of fixing the front bezel of the headlamps. The ordinary outside hinge is not a good proposition for this purpose; it is ugly, constitutes an unnecessary projection, and does not provide that air-tight fit which is necessary to keep the reflector on condition. Most of the new methods take the form of a bayonet fastening; others have long screws passing into the side lugs.

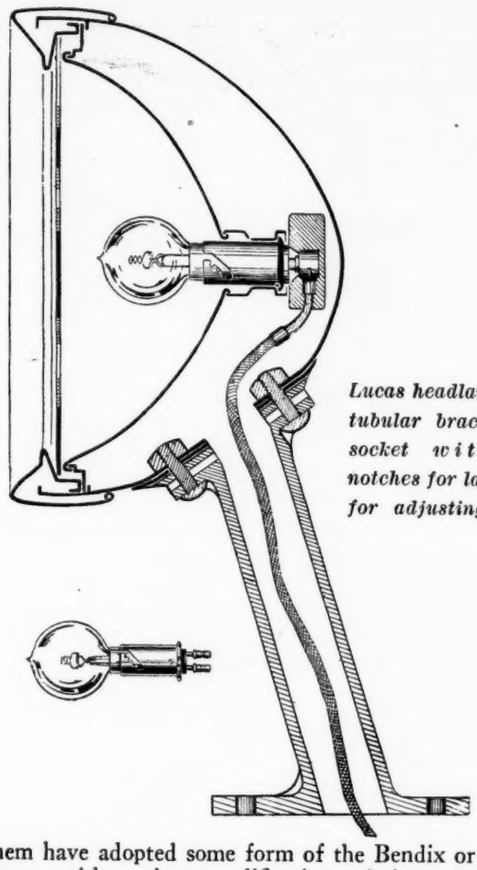
It has been truly said that the design of the lamps either makes or mars the appearance of a car, and there can be no doubt that the British designs for 1920, with their symmetrical outlines devoid of projections, their water-and-air-tight front joints, and their neat arrangements for the connections improve very considerably the appearance of any car to which they are attached.

Focusing is always provided for, one of the newest arrangements being a lampholder with an extended front tube, the slots in which the dowel pegs of the lamp slide having four pairs of notches instead of only one pair as usual. A choice of four different focal positions is thus provided in a simple manner and the necessity for having projections, such as lever ends or screw heads, on the outside of the lamp is avoided.

Side Lamps

Side lamps are generally put on the top of the front fenders, which is undoubtedly the best place. In England it is necessary, in order strictly to comply with the law, to carry two lamps showing the full width of the vehicle, so that the fitting of small bulbs above the main bulbs in the headlamps, or dimming arrangements for the main bulbs, are not legal, and, when they are used, the driver runs a risk of coming into conflict with the police. The practice of carrying the battery in a wood or metal box on the running board is giving way to that of mounting it below the footboards in the centre of the car or, better still, in a small compartment at the back of the front seats. The only objection which can be brought against this innovation is that it slightly lengthens the circuit from battery to starter. Providing the sectional area of the cable is generous, the alteration of position is a good move, for the running boards are kept clear, the cable is protected the whole way, and the battery is less subjected to vibration and jolting, and is almost as accessible. Some improvement is noticeable in the design of battery terminals and connections, but there is still call for more attention to this important point.

Most designers have seriously considered the question of the starter drive and the problems to which it gives rise. Nearly



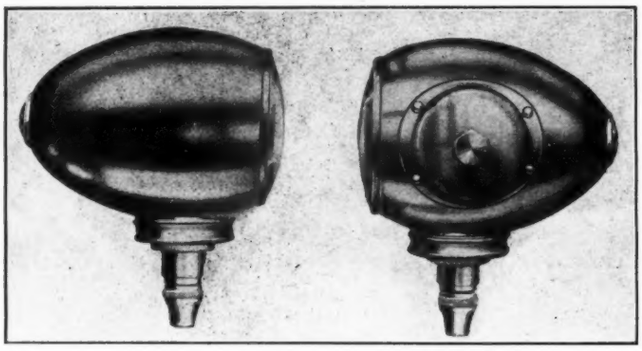
Lucas headlamp with tubular bracket and socket with four notches for lamp pins for adjusting focus.

all of them have adopted some form of the Bendix or moving pinion type, with various modifications aiming at the easy engagement of the gear wheels and the avoidance of "clashing." In one design the addition takes the form of a magnetic brake which is energized at the moment of starting and which tends momentarily to hold the pinoin from turning; in another, the moving pinion has an extension sleeve passing into one of the bearings and the small amount of extra friction set up has a similar effect. In yet another, the moving armature type is combined with a moving pinion; the armature, which is normally held slightly out of its central position by a spring, receives a small amount of current simultaneously with a shunt-field winding, and is drawn endwise into the field and slowly rotated. This movement has the effect of drawing the gears partially into mesh, silently and smoothly. The moving pinion then completes the meshing of the gears and at the same time the ordinary series field is switched on together with full current to the armature.

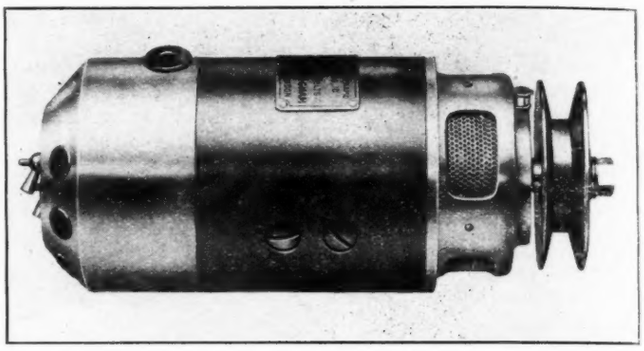
There seems to be a tendency to provide outboard bearings for the motor shaft beyond the pinion. In this type of drive it is important to keep the screw sleeve well lubricated and improved methods of effecting this object would be welcome.

The provision of fuses or other protecting devices seems to require more attention. As insulated return wiring is so generally used in England, and since fuses are often the cause of so much trouble from their uncertain and unreliable action, a great many manufacturers have adopted the plan of dispensing with all but a fuse in the shunt-field circuit, which gives protection in case of a failure in the connection to the battery.

Some features of especial interest may be mentioned in detail. In the new model Lanchester car the Lucas dynamo and starting motor are mounted vertically instead of horizontally as usual, space being thereby saved and the brush gear made very accessible. The motor operates through a free-wheel or over-running clutch and a skew-gear on to a shaft by which the drive is taken to the engine. In addition to the Thomson-Bennett magneto, a Remy battery ignition set is provided, the two systems being entirely independent.



Brolt side lamps with circular lugs



Brolt fan cooled generator showing gauze covered air ports

On the six-cylinder Hispano-Suiza car the Delco combined lighting, starting and ignition system is installed, and an additional battery is provided, besides the one in normal service. The second battery is of comparatively small capacity and is arranged so that it can only be brought into use for ignition and the side lamps, a reserve thus being provided in case of a complete failure of the general electric system.

Powell & Hanmer of Birmingham have a new lighting set embodying a fabric faced friction clutch to keep the armature speed constant. A special feature of this system is that all the leads between such parts as the switchboard and junction box, where many occur together, are contained within a rubber sheath like a hose pipe, giving additional protection where it is useful. A single unit set is also made by this firm and also embodies the friction clutch; in this case it is designed to form part of the driving chain wheel within the crank case of the engine, so that the chain itself is never driven at an excessive speed.

The Lucas Equipment

The Lucas equipment, with which many British cars are to be fitted in 1920, includes several interesting features. The armature of the dynamo is mounted eccentrically in the body of the machine so that by simply rotating the latter in its cradle an adjustment is provided for taking up a slack driving belt. Otherwise the dynamo is of standard type with third-brush regulation, but an innovation occurs in connection with the moving pinion gear of the starter drive. To prevent any chance of jar, and to ensure easy meshing of the gears, a magnetic brake is applied to the pinion to hold it from rotating. This brake takes the form of a horseshoe electro-magnet to which current is admitted at the same to the motor. The pole shoes of the electro-magnet embrace the pinion and tend to keep it from rotating. As the motor rotates, the pinion slides along out of the influence of the magnet and into gear with the flywheel teeth; full current is then automatically switched on.

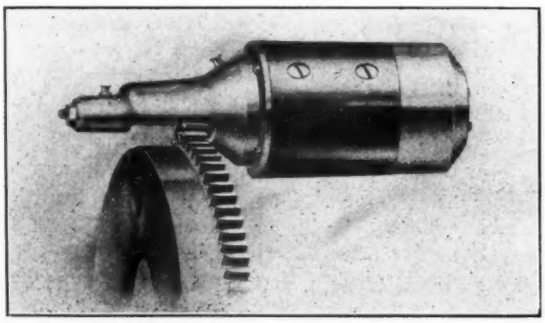
The Lucas starting switch is controlled by a solenoid, which in turn is governed by the action of a small push-button switch on the dashboard. The large cable carrying the starting current need not therefore be brought up to the dash board, the arrangement being on the relay principle.

The Lucas headlamps have a tubular bracket inside which the leads are run, and have the means referred to earlier of focussing the lamp bulbs by means of four pairs of notches in the holders.

The Brolt Dynamo

In the well-known Brolt dynamo a new departure is made by the incorporation of a cooling fan within the casing; by this means it is claimed that the machine can be reduced to half the usual size and weight while maintaining the same output as before. For example, the standard machine giving an output of 12 volts 6 amperes has been reduced in weight from 25 lb. to 12 lb. No trouble is said to be experienced from dirt entering the machine through the air entry apertures. In future designs the fan is likely to be incorporated within the pulley, thereby increasing its efficiency. A good feature in connection with the Brolt battery is the provision of a teak case with a loose front; the cell containers being of celluloid, a very easy means for inspecting the plates is thereby provided.

S. Smith and Sons, the well-known speedometer and accessory makers, have taken up the electrical equipment business, and among their products is to be noticed what is perhaps the neatest switchboard in existence. All that is visible on the outside is the face of the ammeter and above it an aperture in which the words "all off," "side," "head" and "all on" appear in succession as the front bezel is turned.



Brolt starting motor with outboard bearing in position

Southern Automobile Projects

OF COURSE, it long ago ceased to be necessary to quote figures to show that the automotive industry was one of the leaders. But once in a while there are figures that are worth quoting. In a recent Babson report, a paragraph was devoted to the industrial development of the south. The figures quoted were interesting. The total of construction enterprises was listed at 19,000. Of these, 4000 were highway projects, which the automotive vehicles have forced upon the south. Next came 2,000 buildings for automotive purposes, garages, sales buildings and factories. Third was the oil and gas industry with 1,500 projects, and certainly the oil industry owes something to the automobile and its cousins.

The Story of the Hindley Worm Gears

Perhaps you thought you knew all there is to know about Hindley worm gears. They are not new but often familiarity with a subject brings ignorance. Anyway, we venture that you will find something interesting in this brief discussion. It may even be surprising for you to read the recommendations for this form of gear

By H. Fleckenstein

WORM gearing is one of the oldest mechanical movements. An etching made by Albrecht Durer in the Fifteenth Century shows a vehicle driven by worm gears, the worm shaft being turned by hand. These were the ordinary straight worm gears, and no advance in design was noted until the nineteenth century.

About 1857 an English engineer by the name of Hindley designed a worm gear in which the worm followed the contour of the wheel, giving it a shape that is commonly called hour glass. He pointed out that, if a machine could be built for producing this type of gearing, it would be greatly superior to the ordinary straight worm gear.

In regard to the production of this type of gearing, reference is made to some of the earlier text books, which show a concave worm being produced by a cutter revolving on a center.

The Designing

Nothing was attempted in the way of designing a machine for the commercial production of Hindley worm gears until about 1878, when Stephen A. Morse became interested in a patent on a machine for cutting these gears. He obtained the right to build one of these machines and proceeded to have one built. After the usual complications met in building new machinery, about 1880, he perfected the machine and successfully cut Hindley gears.

Later on several machines were built; all the worm geared elevators manufactured by Morse, Williams & Co. were equipped with the Hindley gears, and much of their success was due to this type of gearing, which had a long life. The writer obtained his early training in the design of Hindley gearing and the cutting tools required with Morse, Williams & Co.

About 1883, the United States Government engineers recognized the merits of Hindley gears and began using them on steering engines, windlasses, turret turning, boat cranes, valve motions and many other drives, where a drive was required that would carry heavy loads subjected to shocks or where it was essential to do away with lost motion. This type of gearing is particularly adaptable for valve motion drives, as they can be designed so that the wheel can be the driver and the worm the driven member.

Ordnance Use

This type of gearing has been used by some of the large rubber companies on their special tire making machinery, and is also used extensively for mine hoists, gantry cranes, coal pulverizing machinery, horizontal boring mills and other machine tools.

The United States Ordnance Department uses Hindley worm gears for the elevating, traversing, and sighting movements of guns, including the 240 m.m. howitzer, 8 in. barbette railway mount, 75 m.m. Schneider, anti-aircraft and many others. Many thousands of sets were manufactured and used on the guns made for the war. This type of gearing was found to be indispensable, as no other worm gear was found to stand up so well against the recoil of the guns. As an example of the load a Hindley wheel can carry, we would mention that the load due to the firing of a gun in one of the battleship turrets is 350,000 lb. This load is carried on the pitch line of a gear only 25 in. in diameter.

Hindley worm gears are cut from solid blanks. They are theoretically correct, as the cutters which produce the worm and wheel are rotated on their own axes, and are positively driven. The gears are ground together after they are cut, thus giving a good contact and smoothness of motion.

The advantages of Hindley gears over ordinary straight worm gears are:

1. They have a greater number of teeth in contact for a given pitch.
2. They can be made with a greater depth of tooth.

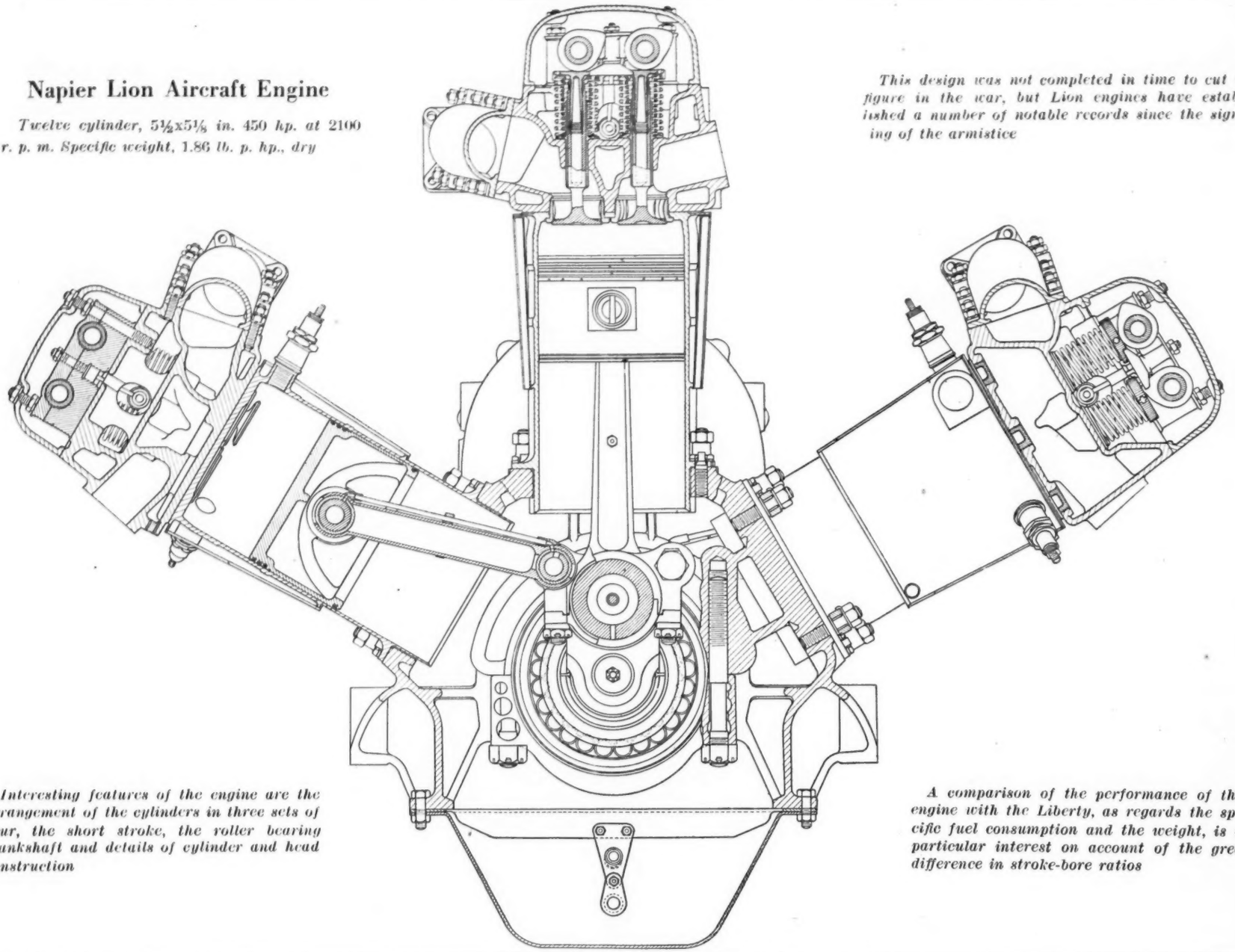
(*Continued on page* 1015)

Paper read at the semi-annual meeting of the American Gear Makers' Association, Boston, October 13-16.

Napier Lion Aircraft Engine

Twelve cylinder, 5½x5⅛ in. 450 hp. at 2100 r. p. m. Specific weight, 1.86 lb. p. hp., dry

This design was not completed in time to cut a figure in the war, but Lion engines have established a number of notable records since the signing of the armistice



Interesting features of the engine are the arrangement of the cylinders in three sets of four, the short stroke, the roller bearing crankshaft and details of cylinder and head construction

A comparison of the performance of this engine with the Liberty, as regards the specific fuel consumption and the weight, is of particular interest on account of the great difference in stroke-bore ratios

Aero Engine With New Arrangement of Cylinders

This 450-horsepower, 12 cylinder engine was designed and built for the British air service. It was not ready for active service when the armistice was signed but it has established some unusual records. The short stroke, the roller bearing crankshaft and details of cylinder and head construction are out of the ordinary

By M. W. Bourdon.

THE aircraft engine now being manufactured on a production basis by D. Napier & Son, Ltd., was not ready for active service before the signing of the Armistice, although it was designed and built with the approval and under the surveilance of the British Air Ministry as an accepted type to form part of the program for 1919. Since November last it has displayed its merits and serviceability on many occasions, notably when it beat the altitude record with a height of 30,500 feet, when it achieved a non-stop run from London to Madrid, a distance of 900 miles covered in 7¾ hours, and when it secured first place in the English "Aerial Derby." The most striking point about its general design is the arrangement of the 12 cylinders (5½ in. bore, 5⅛ in. stroke), which are grouped in three blocks of four, broad-arrow fashion, on a single crankcase.

A particular point of interest in the engine is its extremely low weight per horse power. It is claimed to be lighter than any water-cooled aircraft engine yet produced, for it weighs only 1.86 lb. per h. p. dry, and 2.51 lb. per h. p. wet. Despite this predominant feature, however, the engine as a whole and in detail gives the idea of being robust and that this impression has been gained also by makers of airplanes for commercial purposes is shown by the orders placed with the Napier firm for this engine for civilian and commercial use.

The cylinder blocks are arranged on the crankcase at an angle of 60 deg. between the rows. Each block is built up and consists of four steel liners with sheet steel water jackets. The cylinders of each block are secured to a head casting, which carries camshaft, camshaft bearings and drives under an overall and coverplate and contains the inlet and exhaust ports and passages. Each cylinder is machined from a steel forging and has a closed upper end or crown with four valve orifices to accommodate the separate valve seats. The latter pass through the crown and screw into the head casting, which, it will be realized, is not submitted to the pressures of explosion and compression. The head is of aluminum and is held to the separate cylinders solely by the threaded valve seats. By this method, which eliminates pilots or bolted flanges, the different co-efficients of expansion of steel and aluminum are provided for, as, excepting within the area enclosed by the group of four valve seats in each cylinder, the head and cylinders are free to expand or contract relative to each other without giving rise to distortion of either. The flat machined and ground surface of the head casting rests upon the flat and similarly treated surfaces of the four cylinder crowns.

Originally the four cylinders were enclosed by a single sheet steel water jacket but in the production model each cylinder has its own jacket of sheet steel, welded to it top and bottom. For this purpose a flange is formed extending from each crown and a shoulder occurs near the bottom of the cylinder barrel. Water communication between adjacent barrel jackets occurs through welded-on elbows united by rubber joints, while the water circulation from the jackets to the head occurs through an exterior elbow piece. The barrel jackets are connected at both sides. On the inlet side the passages are at the top of the jackets and of large diameter, while on the exhaust side they are low down and of considerably smaller capacity. The spark plug bosses, one of which occurs at each side of each cylinder, are screwed into the cylinders and welded; the outer ends project through the water jacket walls and are welded to them.

As already suggested, each cylinder has four valves, two inlet and two exhaust, arranged in pairs on opposite sides of the head. The exhaust valves are on the outside of the inclined blocks and on the right of the vertical block looking from the rear end, the propeller end of the engine being considered as the front. The inlet and exhaust valves are not made from the same material and, to prevent mistakes in assembling, the stem of the inlet valve is made larger in diameter than that of the exhaust; the valves and guides are therefore not interchangeable.

The valve guides are of phosphor bronze and a tight drive fit in the cylinder head. Each valve has two concentric helical springs. The overhead camshafts operate the valves directly without the use of rockers or plungers and, to allow clearance adjustment, each valve is provided with a tappet head screwed into the hollow stem. This serves also to retain the springs under compression.

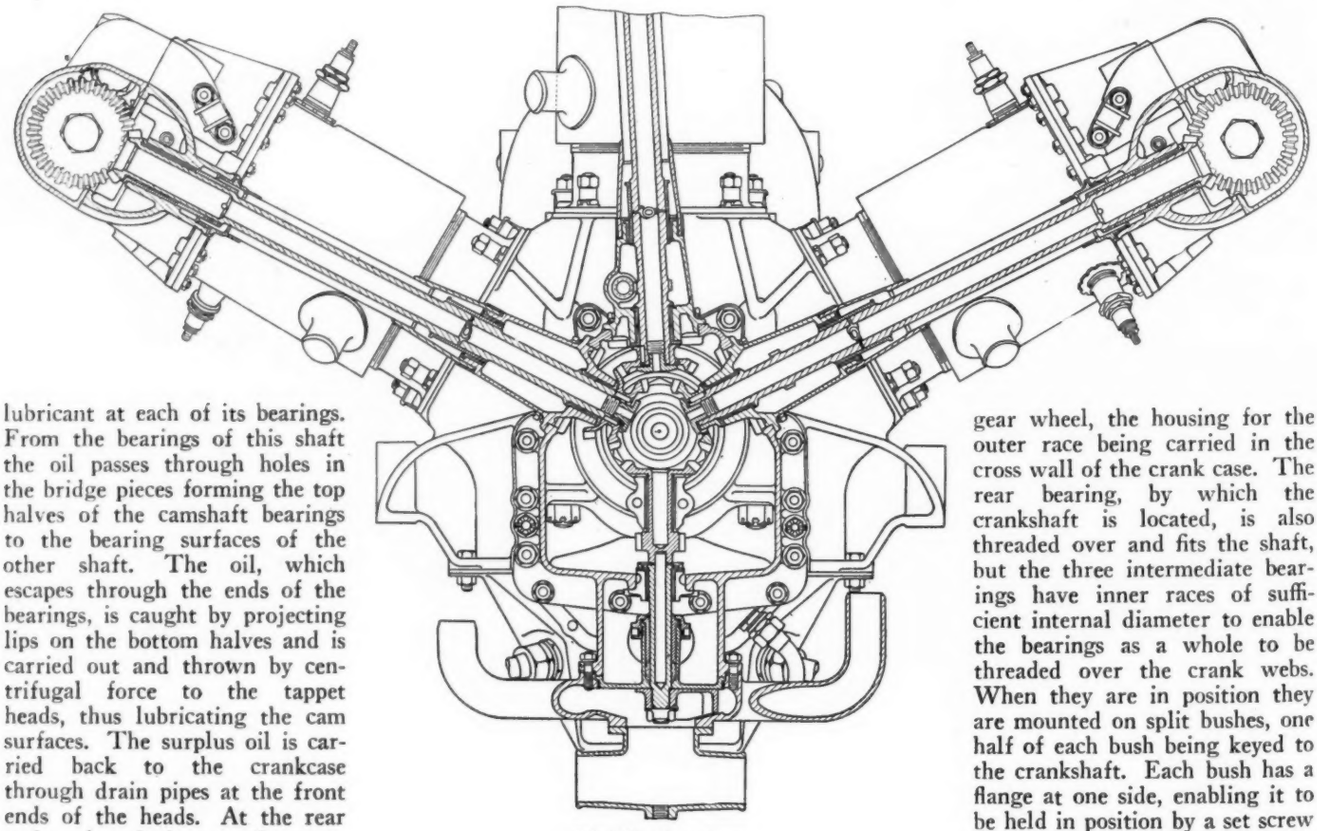
The tappet head has a flat upper surface and is provided with a friction lock. The latter consists of a split ring, the inside diameter of the rim of which is smaller than the diameter of the tappet head. A radial slot is cut through the rim and flange of the ring, which allows it to be sprung over the head of the tappet, locking the two together. The end of the valve stem is slotted at each side and projections within the locking ring are located in these slots. Thus the ring cannot turn independently of the valve and by its agency the tappet head is also prevented from moving relatively to the stem, except when adjustments are being made.

In the latter case the slot in the locking ring is sprung open by a special wrench that frees the tappet head so that the latter can be turned in the valve stem by a peg wrench.

The entire valve mechanism for each block of cylinders is contained in the single head casting, the camshafts being supported in five bearings of bronze made in halves. The heads overhang the rear of the cylinders on each block and the projecting portion encloses the gear by which the camshafts are driven and also carries the brackets and levers for the operating rods of the valve opening gear used for starting the engine.

The camshafts are driven by bevel and spur wheels from inclined and vertical shafts leading from the distribution gearing. On one of each pair of camshafts is a bevel gear made in one piece with a spur pinion which meshes with a pinion of the same size on the other shaft. By this means one driving shaft serves for a pair of camshafts. The latter have their cams formed solid with the shafts, which are drilled and plugged at each end.

For the lubrication of the valve gear, oil is fed to the interior of one shaft, which is drilled for the exit of the lubricant at each of its bearings. From the bearings of this shaft the oil passes through holes in the bridge pieces forming the top halves of the camshaft bearings to the bearing surfaces of the other shaft. The oil, which escapes through the ends of the bearings, is caught by projecting lips on the bottom halves and is carried out and thrown by centrifugal force to the tappet heads, thus lubricating the cam surfaces. The surplus oil is carried back to the crankcase through drain pipes at the front ends of the heads. At the rear ends, the drainage oil passes down through holes in the heads of the casing tubes of the drive shafts and so to the distribution gears.



Distribution gear

Reverting to the cylinders, each unit is held to the crankcase by means of a flange that is machined on the barrel. Each block of four cylinders is secured to the crank case by 20 studs, four passing through the flange of each intermediate cylinder and six through that of each end cylinder. In addition, two studs between each pair of cylinders take effect upon holding-down dogs which overlap the flanges of adjacent cylinders. The latter have deep pilot extensions locating them in a crankcase.

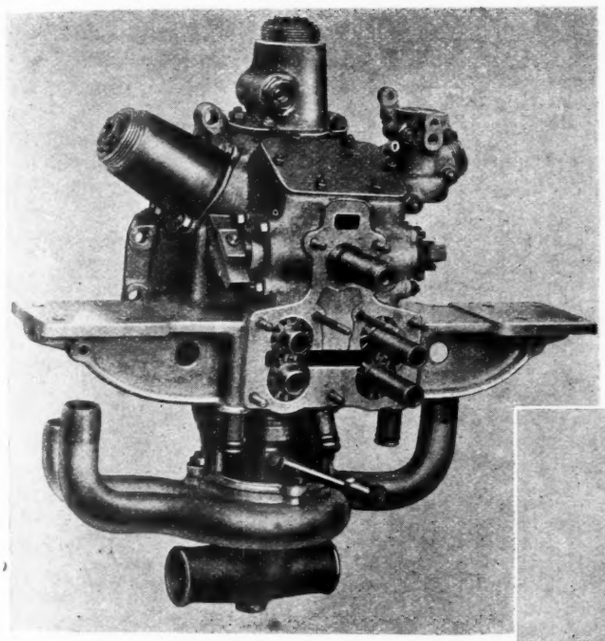
The crankcase itself is an aluminum alloy casting, having three main faces machined to take the twelve cylinders. The hole which takes the pilot of the rear cylinder in each block is carefully reamed and thus serves to register the whole block, the other crankcase holes having a slight clearance around each cylinder base.

The lubrication system, being on the dry sump principle, does not necessitate a crankcase bottom of large capacity and it consists, therefore, of a small cast aluminum pan from which surplus oil is immediately drawn by one or the other of two suction pumps. The bottom of the pan slopes away from the center towards front and back and one suction pump draws oil from each end. Thus, no matter which end of the engine is the higher when the whole is inclined while the airplane is climbing or diving, the oil pan is kept clear of lubricant.

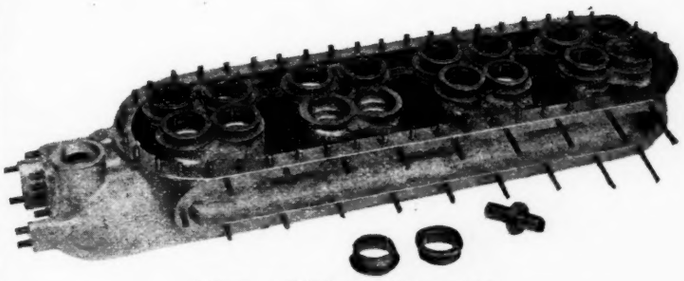
The single crankshaft has four throws and is supported by five roller bearings and a supplementary plain bearing at the front end. The crank pins and journals are bored from end to end, the holes being sealed by means of coned plates drawn together by a central bolt, while the crank webs are drilled to form an oil duct from crankpin to journal, or vice versa.

In regard to the roller bearings, that at the front end is mounted on the shaft prior to the fitting of the reduction gear wheel, the housing for the outer race being carried in the cross wall of the crank case. The rear bearing, by which the crankshaft is located, is also threaded over and fits the shaft, but the three intermediate bearings have inner races of sufficient internal diameter to enable the bearings as a whole to be threaded over the crank webs. When they are in position they are mounted on split bushes, one half of each bush being keyed to the crankshaft. Each bush has a flange at one side, enabling it to be held in position by a set screw that in turn is locked by a split pin.

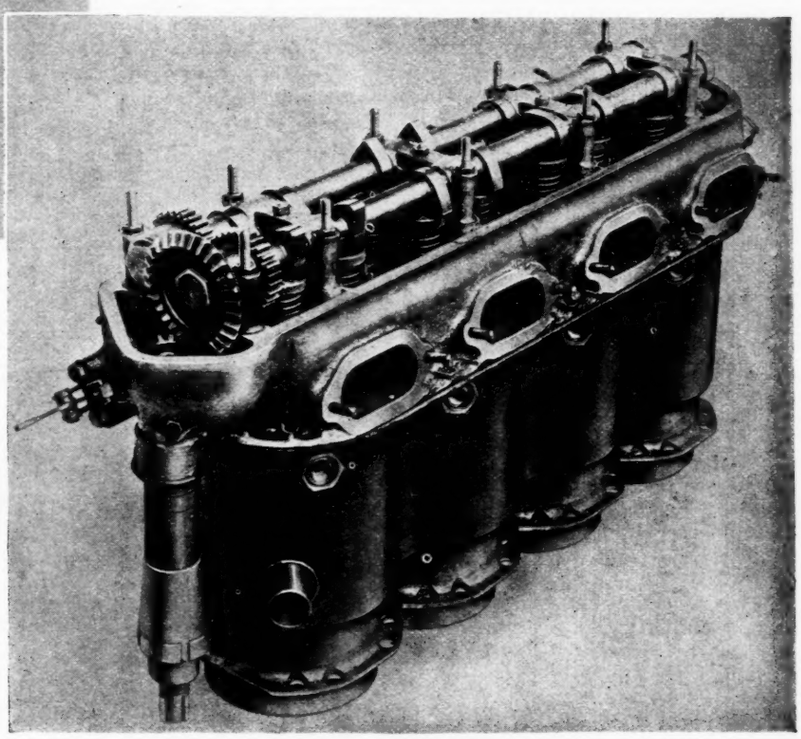
The big-end bearings of the master connecting rods are lined with white metal, while the two side rods are carried on wrist pins fixed in lugs integral with the big-end of the master rod. The latter is of I section but the side rods are tubular. In the case of the former, a steel oil pipe is bolted to the web, while similar pipes are attached by lugs and screws to the bosses at the end of the side rods. The oil is therefore forced under pressure from each end of the crankshaft to the big-end bearings and through the oil pipes on the connecting rods to the piston pins, which oscillate in phosphor bronze bushes in the pistons. Shallow longitudinal oilways are cut in the white metal of the big-ends of the master rods at the joint between the rod and the cap. These oilways are not the full length of the journal and, when the oil hole in the crank pin comes opposite to them, the oil is



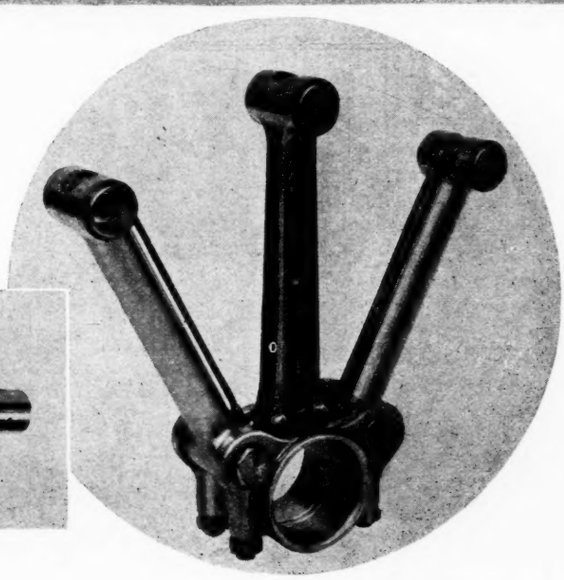
Assembly of magneto drive distributor drive, tachometer drive, oil and water pumps

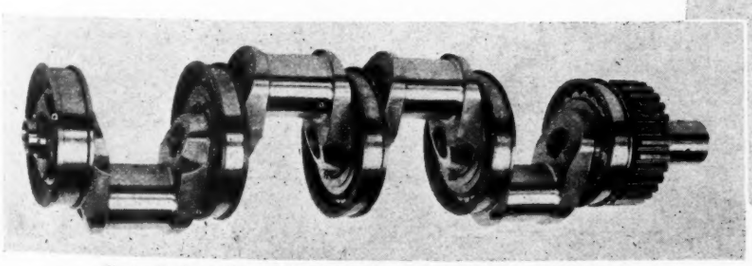


Above—Cylinder head casting
Below—Cylinder block casting with valve gear but without valve cover

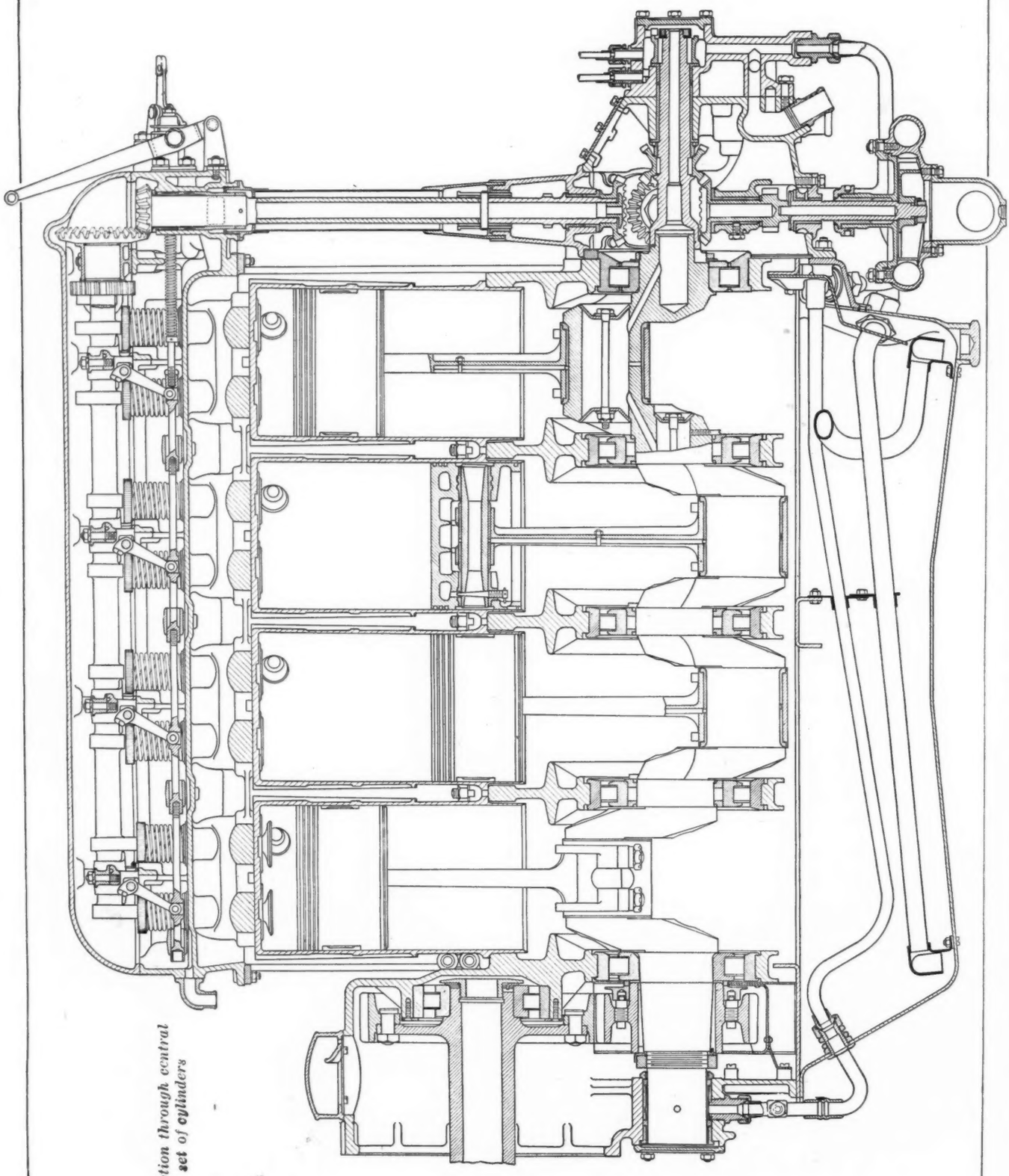


Oil pump body





Cut-off shoulder roller-bearing, four throw crankshaft
Connecting rod assembly



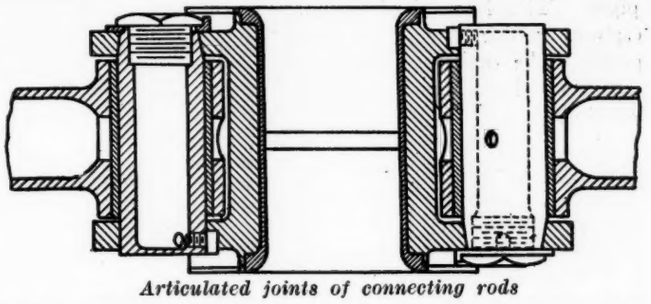
Section through central set of cylinders

fed to inclined holes in the lugs of the side rod wrist pins. The latter are hollow, with one end closed and having a taper seat in the lug, and with the other end plugged by a hexagon-headed plug, which screws into the open end of the pins and prevents the latter from moving endwise. From the hole in the lug, the oil passes to the interior of the pin and thence through the rod end to the oil pipes leading to the piston pins. Owing to the relative motion between the side and master rods and the oil holes in the crankpin, the oil supply to the big-end bearing is continuous, while that to the piston pins is intermittent.

The pistons are of cast aluminum with a flat top. They are very shallow in proportion to the bore, for, while the latter is 5½ in., the pistons measure only 3⅜ in. from the top of the crown to the lower edge of the skirt. Each piston carries four rings, three near the top and one on the skirt. The third ring from the top is a scraper ring, drain holes being drilled through a chamfered edge immediately beneath it. The ring on the skirt is also a scraper. Each piston pin is a driving fit in steel bushes cast with the piston bosses and is fixed by a long taper-ended set-screw, that in turn is locked by a split pin.

The distribution gear casing, which carries the pumps and magnetos, is secured to the crankcase by studs and can be removed from the engine as a unit. The main casting constitutes the end cover of the crankcase and has formed with it on each side brackets which support the two 12 cylinder magnetos. Below the distribution gear case is the water pump, arranged horizontally and bolted to a facing on the main casting. The latter also has formed in it the casings of the two oil suction pumps and the ducts leading to and from them. The pressure pump gear wheels are, however, contained within a separate subsidiary casting bolted to the back of the main casting.

The suction pumps, as previously mentioned, draw surplus lubricant from the oil pan beneath the crank-chamber. On the delivery side, they are connected and together discharge the surplus oil to the separate oil tank, from which the pressure pump draws its supply and delivers it to the crank-

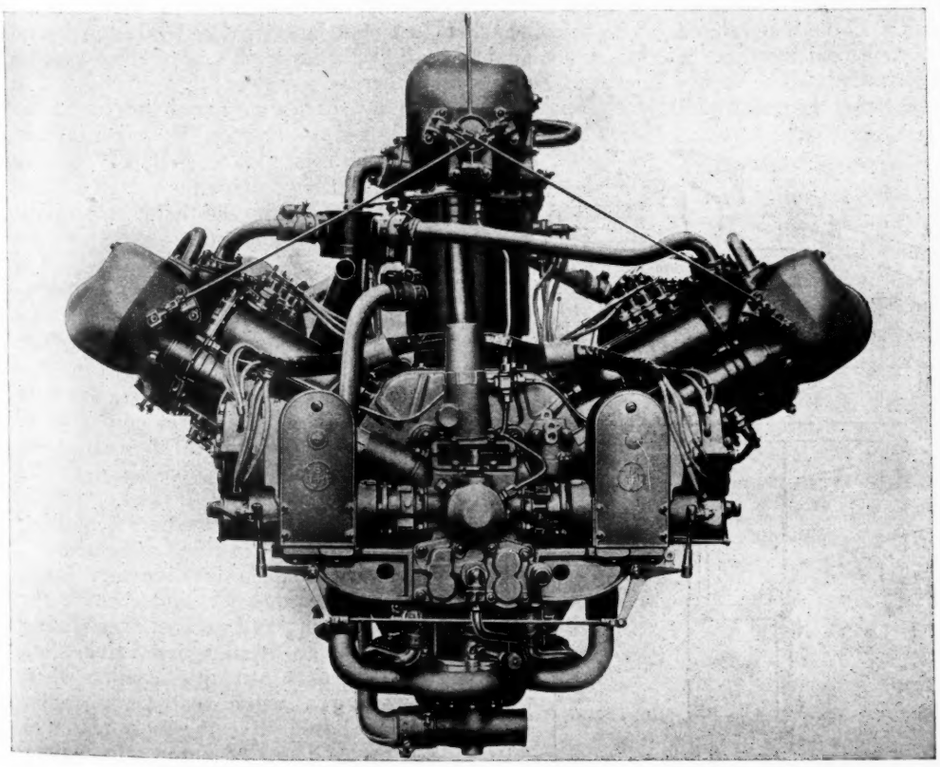


Articulated joints of connecting rods

shaft. The latter, at its rear end, extends beyond the roller bearing, where it is ground to form an oil-tight coupling with a hollow extension or "auxiliary drive" shaft, through which all the distribution gears are driven. Dogs on the extension shaft engage in milled slots on the crankshaft and connect the two together.

The oil from the pressure pump is fed to the end of this auxiliary shaft and also to the front of the crankshaft by a separate pipe which passes through the oil pan to a union below a plain bearing in the casing of the reduction gear. This bearing, which actually forms a sixth crankshaft bearing, is not considered as a main support for that shaft but serves for an "outside" bearing for the driving pinion of the reduction gear. But it also serves, as just mentioned, to convey lubricant to the front of the crankshaft and enables the latter to be fed from both ends.

Returning to the distribution gear, the extension drive shaft carries two bevel wheels formed as a unit. The rear bevel actuates the magnetos through two other bevel gears, and the front one drives directly through two bevels the two inclined camshaft drive shafts and, indirectly, the vertical drive shaft. This front bevel also actuates the water pump through a vertical coupling shaft which, by means of skew gears, operates the suction oil pumps. The pressure oil pump gears are mounted on extensions of the shafts of the right hand suction pump and are enclosed in an endplate that also serves as a junction box for the oil delivery and suction pipes.



Distribution end of engine

On the drive shaft for the camshaft of the vertical cylinders is skew gearing for driving the tachometer, while on the right hand drive shaft is a skew gear for a Remy distributer.

The lower portion of each cam drive shaft is connected to the upper portion by a splined sleeve, which allows a slight telescopic movement to permit of the adjustment of the bevel gears.

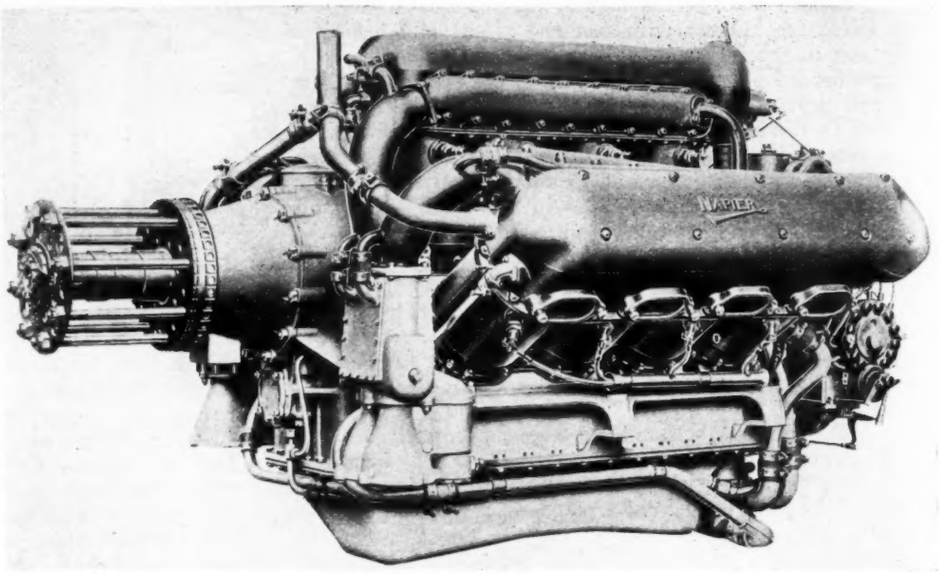
The magnetos are driven by laminated spring couplings and by driving flanges that allow a vernier adjustment for the timing by reason of one member having a greater number of holes than the other for the coupling bolts.

The water pump is of the centrifugal type, with a casing of aluminum from which three outlets lead to the three cylinder blocks.

One single and one duplex Claudel carbureters are provided, the left-hand and vertical blocks being supplied by the latter. Vaporization at high altitudes is ensured by hot water jacketing around and above the throttles and around the steel induction

pipes. The latter lead to unit castings which cover the inlet ports. The exhaust ports are separate and each has its own outlet pipe.

An interesting feature of this engine is the provision for easy starting. T-headed levers, acted upon simultaneously by a rod passing from end to end inside each head casting, depress the tappet heads of one inlet and one exhaust valve of each cylinder when a control lever in the cock-pit is operated. Another control lever operates a valve which connects an auxiliary carbureter or "vaporiser" with the induction pipes; a hand pump is provided and connected to the vaporiser and if this be operated a correctly proportioned, combustible mixture is driven into every cylinder, any burnt gases remaining therein being first expelled through the open exhaust valves. When the valves are closed again a hand-operated "starter" magneto supplies current to the plugs through a special distributer on one of the main magnetos. Although the mixture in the cylinders is not under compression, igniting it serves to provide the initial movement of the crankshaft.



View from propeller end

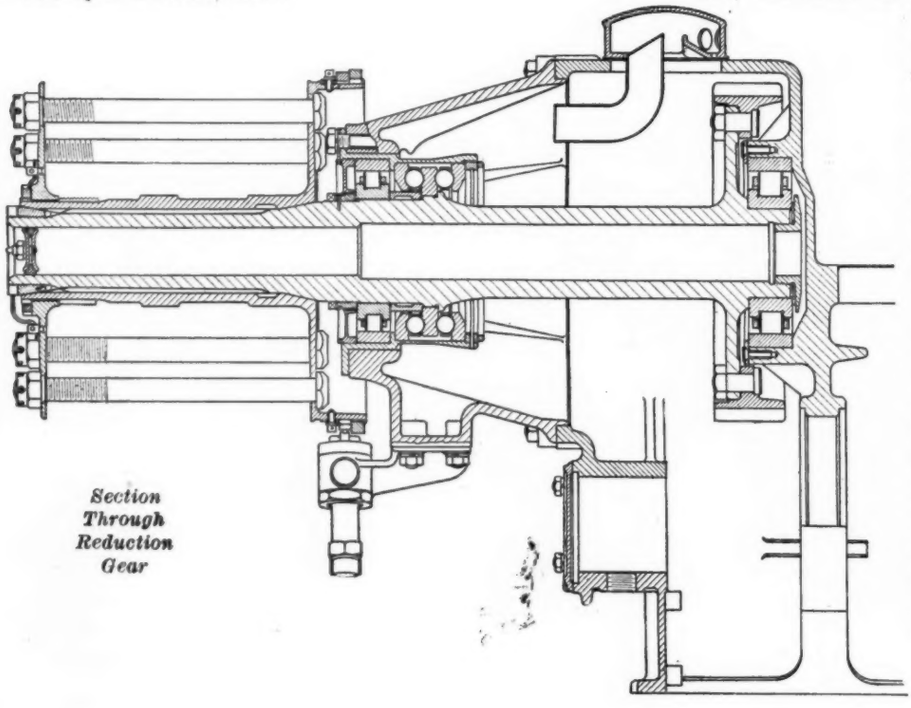
The Starting Vaporizer

The vaporizer for starting is simply a spray carbureter in which the depression required to draw fuel from the jet is provided by the hand pump. Air is forced, by way of a venturi tube arranged in the centre of the float chamber, past a horizontal spraying nozzle, and a certain amount through a by-pass into the upper part of the float chamber. The mixture of air and fuel is carried upward through an atomising chamber, which is cone shaped and contains a series of vire gauze screens. The vaporizer as a whole is arranged inside a large heating jacket which may, in cold weather, be filled with boiling water to assist vaporisation. The spraying jet is adjustable by means of an exterior control which acts upon a needle valve.

As already mentioned, two 12 cylinder magnetos are fitted; each one supplies current to all cylinders, there being two plugs per cylinder. The magnetos are driven at one and a half times crankshaft speed and the order of firing is as follows:

Propeller End.		
7	2	9
4	11	6
10	5	12
1	8	3

A casing for the reduction gearing is cast in one piece with the crank case. The gearing is of the simple, straight tooth, spur pinion type, the driving wheel mounted on the crankshaft having 29 teeth and the driven wheel 44 teeth. The propeller shaft is mounted on two roller bearings, and has a double ball-bearing thrust washer, for the engine is designed to be used either as a pusher or a tractor. The propeller hub is driven by splines on the shaft and in the hub, the latter being locked in position by a coned nut. The hub is also castellated to take the hub flange, which is castellated internally to suit and held in position by a thin circular nut.



Section Through Reduction Gear

Two points of design in this engine have been criticised. The first is the difficulty of removing one of the valves. If this operation be specially undertaken it is necessary first to disconnect the camshaft drives of that block and all the wires and piping, take the whole block off the crankcase, and withdraw the valve through the cylinder above. But the maker's reply to this criticism is that there is nothing unintentional in this arrangement. Realizing that is is necessary more often to remove a cylinder block for decarbonizing and general overhauling than it is to attend to a valve, they took this fact into consideration when designing a valve seat arrangement which should have the most effective cooling and not be subject to distortion. Valve troubles, it is pointed out,

(*Continued on page* 1015)

Horsepower Determination at the British Trials

This is an interesting incident of the recent British Tractor Trials. When all was ready to measure the power of the tractors, it was found that the proper instruments were not at hand. But a means was provided, and the account of how this came about will interest even American engineers, resourceful as they may be

By H. Scott Hall

WHEN the Society of Motor Manufacturers and Traders decided to make drawbar tests at the tractor trials held under its auspices at Lincoln, England, recently, it had some difficulty in finding an instrument for use in carrying out the tests. Several ordinary spring drawbar dynamometers were available, but none of them were fitted with recording apparatus, and the latter was held to be an essential fitting.

Finally, it was discovered that the National Physical Laboratory had a portion of one which was used some years ago in tests to determine the drawbar effort of a motor-car on the various types of road surfaces common in Great Britain. The essential part of this instrument, the recorder, was almost intact, so the officials at the Laboratory immediately set to work to make a suitable drawbar and to put the recording apparatus in good working order.

The dynamometer is in two main portions, the drawbar, and the recording mechanism. It was carried by an ordinary steam-wagon trailer with a load capacity of eight tons, and, therefore, presumably able to provide, when loaded to its limit, all the tractive resistance likely to be required. These trailers are constructed on the same principle as the old-fashioned horse-drawn wagons, that is to say, the front end rests on a fifth wheel. The customary drawbar was removed, and in its stead was fitted a pair of stout channels which carried the new drawbar with its hydraulic dashpot, the recorder and all the accessories.

The tractor hitches to the front end of a horizontal rod, which is connected, through the medium of a pair of buffer-springs, to an eye at the lower extremity of a bell-crank lever. The buffer-springs are disposed on each side of this eye. The bell-crank lever is fulcrumed on a bracket formed on the rim of a shallow dash-pot cylinder having a plunger area of 50 sq. in.

The second arm of the lever, equal in length to the first, lies over the dashpot, and at its outer end is coupled to the plunger of the dashpot. The full range of movement of the plunger is only $\frac{3}{16}$ in. If reference be made to the close-up view of the apparatus, portions of the spring coupling can be seen, also the downwardly projecting arm of the bell-crank lever. The dashpot is hidden by one of the main channels. The whole of this part of the mechanism can be lifted or lowered in the frame to which it is secured by bolts working in slots to allow for variations in height of drawbar attachments.

The recording apparatus is based on the principle of the Bourdon tube as used in steam gauges. The tube is placed in communication, through the medium of flexible tubing, with the inside of the draw-bar dashpot, and the whole filled with water. Pressure exerted by the dashpot plunger is therefore communicated direct to the Bourdon tube, which behaves accordingly. The outer end of the tube operates a pencil which bears on paper which is led over a revolving drum. The drum is driven by gearing from the trailer wheel.

In order to facilitate the working, a speedometer was fitted. One observer sat with his hand to the wheel of a powerful screw-down brake which took effect on the rear wheels of the trailer, which wheels were fitted with lugs to minimize slipping. The principal duty of this observer was to watch the speedometer and, by manipulation of the brake, to keep the speed of the outfit to approximately 2½ m. p. h. Another observer sat on the other side of the instrument; his duty was to see that the recorder was functioning correctly.

An attempt was first made to either slip the wheels or stall the engine. In all but a few cases the former occurred. This gave the engineer a reading for the maximum drawbar effort. Subsequently the machine was driven at 2. 5 m. p. h. and the dynamometer reading then given to be a fair measure of the tractor's capacity.

The roller on which the record paper traveled was driven from one wheel of the trailer and the speedometer from the other. In order that there might be some latitude in the length of the record the final drive to the paper drum was through a round belt and 3-step cone pulleys. The whole apparatus gave complete satisfaction. As an emergency measure, an additional trailer without special fittings was available and it was used once or twice with the heaviest tractors to provide additional load.

Reducing the Cold Engine Troubles

Here is a new device that puts the water circulation under control of the driver by means of a butterfly valve, controlled by a Bowden wire from the dash, in one of the pipes. This will materially shorten the time required to warm up the engine, thereby reducing crankshaft dilution and other troubles. The device is not in production, but the tests are so complete that the plans for manufacture are going ahead

By J. Edward Schipper

VARIOUS methods have been suggested for shortening the warming-up period and so reducing crankcase dilution and other cold engine troubles. The Johnson Co., manufacturers of carbureters, are about to manufacture a device which is intended to accomplish this result in a very simple manner, consisting simply of a butterfly valve located in one of the water circulating pipes and controlled by a Bowden wire from the dash. The device is installed by cutting the rubber pipe to or from the radiator and inserting the metal tube containing the butterfly. The control is then set up and mounted on the instrument board, thus putting the circulation of the water virtually in the hands of the driver.

To determine the results given by this device a series of tests were made in which it was thought to establish three items as follows:

1—Effectiveness of controlling the water to the engine to maintain proper and efficient operating temperatures.

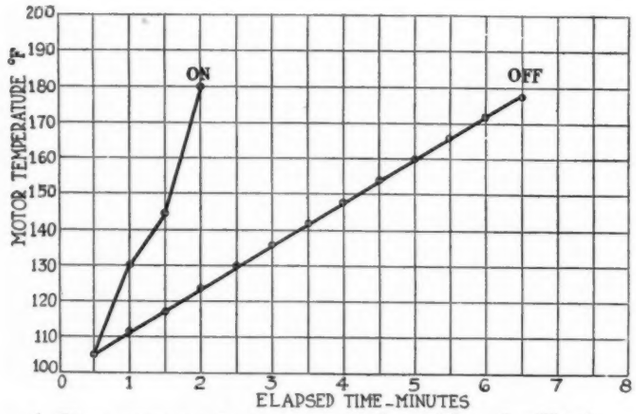
2—To determine the time factor in heating up the engine.

3—To determine the difference in control.

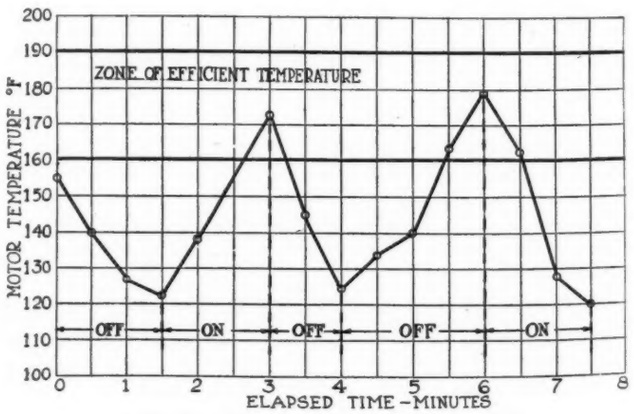
A—With regulation of water flow in proportion to throttle opening by interconnecting the water throw controlling valve and the carbureter throttle valve; or,

B—With regulation of the water throw independent of throttle and set to meet changing conditions.

The results of these tests are graphically shown on the curves herewith. The tests were made on an Oakland six-cylinder $2\frac{13}{16}$ by $4\frac{3}{4}$ in. engine of 177 cu. in. piston displacement. On this engine the centrifugal water pump is driven by a belt at the front end of the cylinder and discharges directly to the water jacket at the front of No. 1 cylinder. The water tank has a capacity of $4\frac{1}{2}$ gal. and is provided with an overflow at the top and a cold water feed pipe with a discharge opening at the bottom. The regulating valve was placed in this feed pipe and suitable dash control installed. Thermometers were placed in the radiator inlet and outlet pipes.



Time necessary to warm up engine with and without circulation control

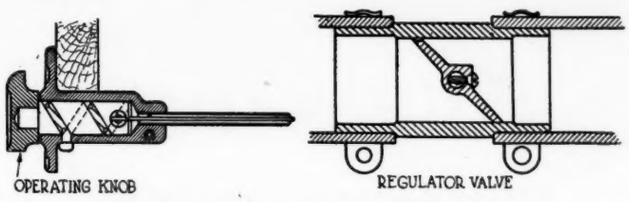


Temperature regulation with Temp-Trol

The first test in which the water flow control was inter-connected with the carbureter throttle showed a temperature rise in 10 min. of from 90 deg. to 172 deg., giving an average rise per minute of 8.2 deg. Fahr. The water flow controlling valve with this arrangement is closed when the carbureter throttle is in closed position, and the engine was started when cold with the tank full of cold water. The engine speed started at 1100 r. p. m. and slowly climbed to 1180 r. p. m. as it became warm. The difference in temperature between the inlet and outlet averaged about 10 deg. Fahr. The complete series of tests under varying conditions showed that it is possible to maintain the water temperature at the point desired by means of the Temp-Trol, the trade name under which the device is known.

The analysis establishes the fact that with the circulation controls inter-connected with the engine throttle, so that when the throttle is closed the circulation control valve is closed, the rise in temperature of the total volume of water is relatively slow, even when no external cooling is applied.

With the circulation valve disconnected from the carbureter throttle, the temperature rises rapidly regardless of the fact that the incoming water is decreasing in temperature. This demonstrates that independent control is the better way of properly meeting the flow of water and to regulate it to meet the change in inlet water temperature, due to the cooling influence as a result of the drainage in atmospheric temperature, of any other conditions which would affect the temperatures of the incoming water. The tests showed that the temperature difference between the inlet and outlet varies between 21 and 103 deg., but with the independent control of the circulation valve the natural temperature difference does not affect the fact that the engine can be operated at the selected water temperature.



Temp-Trol temperature control system

The Story of the Hindley Worm Gears

(*Continued from Page* 1005)

3. The teeth on the wheels have a straight side, which produces a flat bearing surface between the threads on the worm and the wheel teeth. On account of this fact, they have a greater bearing surface, and slide together correctly.

Therefore, there is only one action on the teeth of these gears, that is a sliding motion at right angles (or nearly so) to the worm shaft.

The ordinary straight worm gears have practically two actions—a sliding contact at right angles to the worm shaft, and a rolling contact (the action of the teeth of the wheel, rolling in and out of the threads of the worm, similar to the contact of the teeth of two spur gears).

On account of the greater bearing surface of the teeth, a greater load can be carried on a Hindley worm wheel than on an ordinary straight worm gear of the same size. The given load is distributed over a greater bearing surface, thereby allowing the carrying of a greater pressure on the teeth, or if the same load is carried as on a straight worm gear, the bearing pressure is greatly reduced.

Hindley worm gears are especially adaptable for large reductions and high speeds, and under these conditions we have obtained very high efficiencies.

The ordinary straight worm gear has only a line contact on the pitch line of the teeth (or a flat strip of bearing surface, the width of which depends on the compressibility of the metal), and an actual contact of an oil film or globule on this line. The size of this globule depends on the pressures, and the amount of clearance or backlash existing in the gears. Therefore, the load carrying capacity of the straight worm gear depends on this globule.

The Hindley worm gear has a large flat bearing surface across the width of the wheel face, enabling it to have a flat oil film between the teeth and the threads, this film being many times larger than the globule of the straight worm gear.

When Hindley worm gears are run at low speeds, bearing pressure almost equal to the breaking strength of the metals can be carried.

We are often asked—

"What efficiency do you get with the Hindley worm gear?"

There is only one reply to the question, and that is—

"Under what conditions are the gears to be used?"

The speed, pitch, ratio, method of mounting, and lubrication all have to be carefully considered before this value can be determined.

The Napier Engine

(*Continued from page* 1012)

arise nearly always from distortion of valve or seat, and if this possibility be eliminated, to all practical purposes, there is no need to make the valves readily removable independently of the other parts.

The second criticism relates to the distribution gearing, which has been termed "complicated." But this does not appear to be fair, for if the number of auxiliary drives be remembered it will be realized that the units of the distribution have been reduced to a minimum.

Analyzing the Question of the Stroke-Bore Ratio

In this article Mr. Ingram is doing a bit of pioneering. Starting with available data, he has supplied an analysis of long versus short stroke engines, taking into consideration all the forces acting on the bearings. He demonstrates why bearing loads will be lower in the short stroke type at high speeds. There are, perhaps, more factors in this analysis than you supposed

By Edward G. Ingram

THERE are three chief questions to be considered in connection with the subject of stroke-bore ratio. These are the relative power output, relative bearing wear and relative weight of the long and short-stroke forms of engines.

By the use of methods similar to those used by Otto M. Burkhardt in determining the loads on engine bearings, some of which were described in an S. A. E. paper which was published in a recent issue of AUTOMOTIVE INDUSTRIES, the writer here makes what he believes to be the first satisfactory analysis of the effect of the stroke-bore ratio upon bearing loads.

In investigating the subject of stroke-bore ratio it must be understood that the question of interest is what stroke-bore ratio will give the best results with an engine of given piston displacement. In comparing the long with the short-stroke forms it is, of course, necessary to assume in both cases the same general design throughout with regard to valve location, valve dimensions, compression ratio, ratio of connecting-rod length to stroke and so forth.

Since the displacement is the same in both forms, at any given number of r.p.m. each will take in the same amount of gas on the intake stroke and expand it the same amount on the expansion stroke, and since the valve areas are the same the maximum speeds of revolution will be the same and the same quantity of gas will pass through both engines in a unit of time. The only thing which can cause a difference in the maximum indicated horsepower of the two forms, therefore, will be a difference in the mean effective pressure due to the fact that the combustion chamber is slightly more compact in the long-stroke form. This difference will be slight, as will be shown later on in this article.

In taking up the relative bearing loads in the two types of engines we will mainly consider the forces acting on the crank pin, since these are most involved with the question of stroke-bore ratio. The crank pin is affected by the action and reaction of three forces; the gas pressure E acting on the piston head, the inertia force I due to the reciprocating masses which include the piston and the upper part of the connecting rod, and centrifugal force C due to the lower part of the connecting rod and its bushing which may be considered as rotating weight. In comparing long and short-stroke engines of the same piston displacement, force E at any point in the stroke will always be greater in the short-stroke engine, the amount being in direct proportion to the area of the pistons.

In the comparison which we are about to make we are going to assume force I, due to the acceleration and deceleration of the piston and part of the connecting rod, to be the same in both the long and short-stroke forms of engines for the following reason:

It must be remembered that as we increase the bore of an engine and decrease the stroke, the piston displacement and speed of revolutions remaining the same, while the weight of the piston increases the piston speed decreases. That is, as we increase the mass we decrease the rate of acceleration and deceleration, so that the inertia forces tend to remain the same.

The expression for determining the inertia force is

$$F = .0000142\ w\ l\ N^2\ (\cos 0 - \frac{1}{2n}\cos 2\ 0)\ \text{pounds}$$

Where w is the weight of the reciprocating parts in pounds, l the length of the stroke, N the number of revolutions per minute, n the ratio of the connecting rod length to the stroke, and 0 the crank angle.

Now it will be seen from the above that if we multiply the stroke l by say ½ we can then multiply the reciprocating weight w by 2 without increasing the inertia force. That is, the inertia forces will be the same in two engines with different stroke-bore ratios if the weight of the reciprocating parts is inversely proportional to the stroke. We will assume this to be true in actual practice in the case of cylinders of the same displacement but different stroke-bore ratios and take the matter up in more detail later.

Assuming the weight of the lower parts of the connecting rods together with their bushings to be the same in both engines, which will be nearly correct—

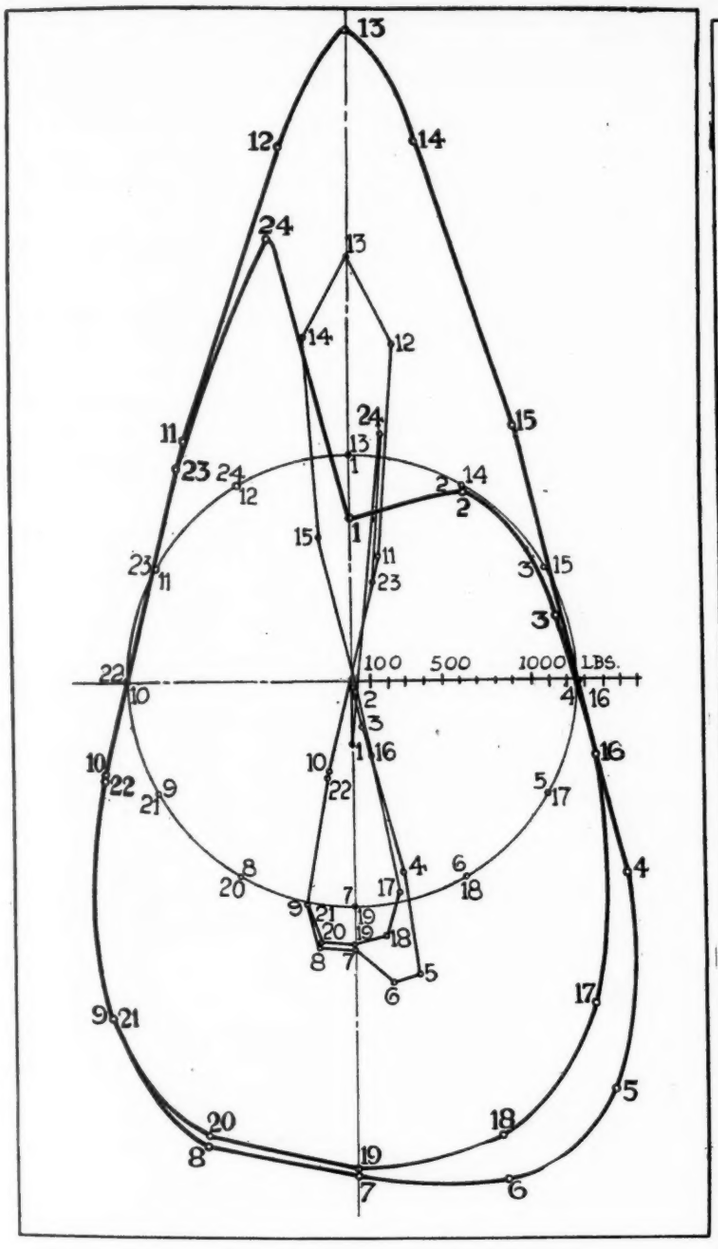


Fig. 1—Long stroke engine

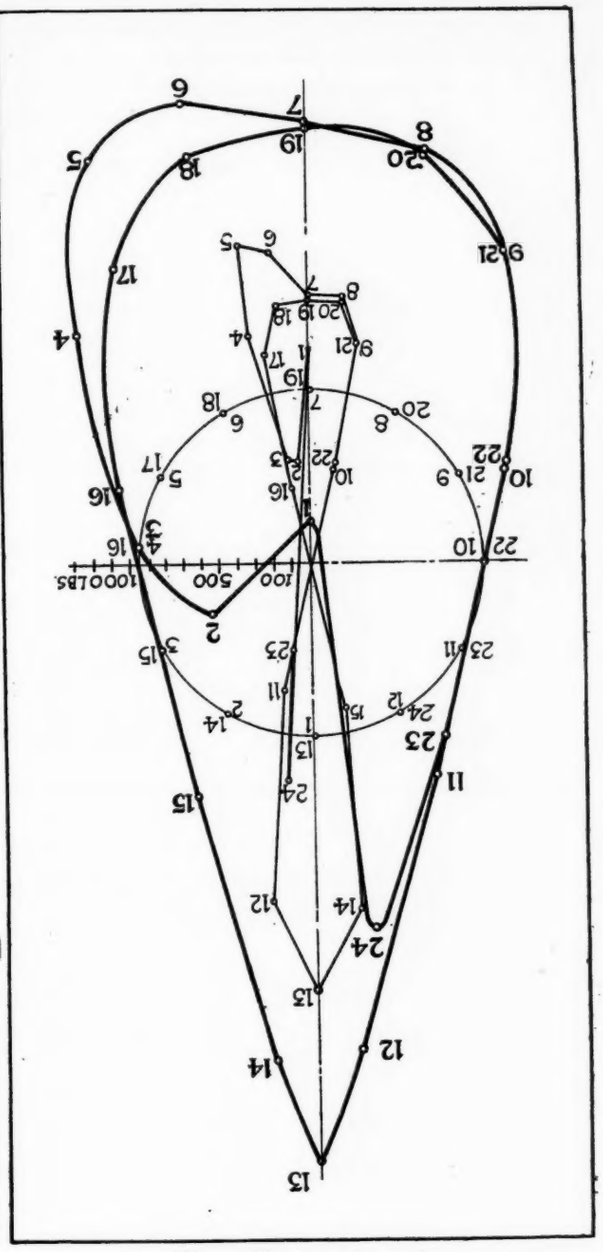


Fig. 2—Short stroke engine

though favoring slightly the long-stroke engine whose rod will be slightly longer—running at an equal number or r.p.m., force C will be lower in the short-stroke engine, the amount being directly proportional to the length of the crank throws.

For purposes of comparison we are going to consider the forces acting on the crank pins of two engines running under full power at 2,600 r.p.m., one having 3½ by 5¼-inch cylinders and the other 4 by 4-inch cylinders, the piston displacement being the same in both cases and the stroke-bore ratios 1.5 to 1 and 1 to 1 respectively.

Forces E, I, E + I, and (E + I) Sec. B for different crank positions from 0 to 720 deg. (this constituting one complete working cycle) are shown for the long stroke engine in Table I. The force (E + I) Sec. B is the actual pressure on the crank pin due to forces E and I, B being the acute angle the connecting rod makes with the vertical. The length of the connecting rod is assumed to be twice the stroke.

In Table 2 similar figures are given for the short-stroke engine. It will be noted that here force E for each crank position is 31 per cent greater than in the case of the long-stroke engine, owing to the greater piston area.

The forces (E + I) Sec. B acting on the crank pins of the long and short-stroke engines are represented graphically in magnitude and direction by points 1 to 24 of the zig-zag curves shown in Figs. 1 and 2. Positive forces set upward and negative forces downward.

The centrifugal force C which is in phase with the crank pin and amounts to 1,250 pounds in the case of the long-stroke engine, is represented by the circle shown in Fig. 1. Owing to the shorter crank throw, force C is 30 per cent. lower in the short-stroke engine, amounting to 950 pounds, as shown graphically by the circles in Fig. 2.

The total load on the crank pin for the different crank positions is found by combining the forces of the

zig-zag curve with the forces of the circle. This has been done for both the long and short-stroke engines and yields the pear-shaped curves shown in Figs. 1 and 2.

It will be seen at once from an examination of these curves that both the maximum and average bearing loads are lower in the short-stroke engine; the average load on the crank pin of the long-stroke engine will be about 2,180 pounds and that on the crank pin of the short-stroke engine about 1,880 pounds, or about 13.7 per cent lower. At higher rotative speeds the difference in favor of the short-stroke engine will be even greater, which is interesting in view of the popular idea that abnormally long strokes should be used for high speed reaching car engines.

The loads on the main bearings of the short-stroke engine will be less because of the lower crank pin pressure and also because the centrifugal force acting on the main bearings due to the crank pin and those portions of the crank cheeks which are not balanced in their own plane will be less owing to the fact that the cheeks are shorter and the pins nearer the center of rotation.

Of course, the load on the piston pin of the short-stroke engine will be somewhat greater than in the long-stroke engine, but it must be remembered that owing to the small movement wear is not very rapid here; also, the larger piston of the short-stroke engine permits of making the piston pin bearing somewhat longer so that the unit pressure can be kept about the same.

Load on Bearings at Low Speeds

At speeds lower than 2,600 r.p.m. the difference in the average loads on the crank pins of the two types of engines will be less and after a certain point the advantage will shift to the long-stroke engine.

Both the inertia and centrifugal forces vary as the square of the speed of revolution. At half of the assumed maximum speed, or 1,300 r.p.m., which would approximate the normal touring speed, force I for each crank position will be one quarter as much as at 2,600 r.p.m. Force C will also be one quarter as much in each engine. If we assume force E due to the gas pressure to be the same at this speed it will be found that the average pressure on the crank pin of the long-stroke engine will be nearly 4 per cent less than that of the short-stroke engine.

However, force E would only be the same when the throttle was wide open, as when the car was going up a steep hill on the high gear. In normal running the throttle would probably be less than half open, in which case force E would be much lower.

Since the loads on the crank pins of both engines at 1,300 r.p.m. will be low compared to the loads at 2,600 r.p.m. it would appear that the difference in bearing wear due to the slightly higher average load on the

Table 1

Gas Pressure, Inertia Force and Cylinder Wall Thurst in Long-Stroke Engine

No.	Crank Position Degrees	E	I	E + I	Sec. B (E + I)
		Power Stroke			
1	00	—2700	+2360	— 340	— 340
2	30	—1830	+1800	+ 30	+ 30
3	60	—1000	+ 740	+ 260	+ 266
4	90	— 600	— 460	—1060	—1095
5	120	— 430	—1200	—1630	—1667
6	150	— 210	—1450	—1660	—1673
		Exhaust Stroke			
7	180	— 0	—1485	—1485	—1485
8	210	— 20	—1450	—1470	—1482
9	240	— 30	—1200	—1230	—1258
10	270	— 50	— 460	— 510	— 527
11	300	— 40	+ 740	+ 700	+ 716
12	330	— 20	+1880	+1860	+1875
		Inlet Stroke			
13	360	— 0	+2360	+2360	+2360
14	390	+ 30	+1880	+1910	+1925
15	420	+ 50	+ 740	+ 790	+ 808
16	450	+ 40	— 460	— 420	— 434
17	480	+ 30	—1200	—1170	—1197
18	510	+ 20	—1450	—1430	—1441
		Compression Stroke			
19	540	+ 20	—1485	—1465	—1465
20	570	0	—1450	—1450	—1467
21	600	— 30	—1200	—1230	—1258
22	630	— 70	— 460	— 530	— 547
23	660	— 200	+ 740	+ 540	+ 552
24	690	— 510	+1880	+1370	+1381

Table 2

Gas Pressure, Inertia Force and Cylinder Wall Thrust in Short-Stroke Engine

No.	Crank Position Degrees	E	I	E + I	Sec. B (E + I)
		Power Stroke			
1	0	—3537	+2360	—1177	—1177
2	30	—2358	+1800	— 558	— 562
3	60	—1310	+ 740	— 570	— 583
4	90	— 786	— 460	—1246	—1287
5	120	— 563	—1200	—1763	—1804
6	150	— 275	—1450	—1725	—1739
		Exhaust Stroke			
7	180	0	—1485	—1485	—1485
8	210	— 26	—1450	—1476	—1488
9	240	— 39	—1200	—1239	—1268
10	270	— 65	— 460	— 525	— 542
11	300	— 52	+ 740	+ 688	+ 704
12	330	— 26	+1880	+1854	+1869
		Inlet Stroke			
13	360	— 0	+2360	+2360	+2360
14	390	+ 39	+1880	+1919	+1934
15	420	+ 65	+ 740	+ 805	+ 824
16	450	+ 52	— 460	— 408	— 421
17	480	+ 39	—1200	—1161	—1188
18	510	+ 26	—1450	—1424	—1435
		Compression Stroke			
19	540	+ 26	—1485	—1459	—1459
20	570	— 0	—1450	—1450	—1462
21	600	— 39	—1200	—1239	—1268
22	630	— 92	— 460	— 552	— 570
23	660	— 262	+ 740	+ 478	+ 489
24	690	— 668	+1880	+1212	+1222

crank pin of the short-stroke engine would be small. On the other hand, the difference in the bearing loads of nearly 14 per cent in favor of the short-stroke engine at maximum speed when the loads are high is worth while.

For a high speed touring car engine it seems apparent that the short-stroke construction is superior. For truck and tractor engines, on the other hand, which will operate at low speeds under full power a good deal of the time, there will be an advantage in the long stroke construction. For racing car engines which must operate nearly all of the time under maximum power at speeds as high as 3,500 r.p.m. the superiority of the short-stroke construction is obvious.

Relative Piston Size and Weight

The side pressure on the piston for any crank piston equals (E + I) tan B. The maximum side pressure on the pistons of both the long and short-stroke engines running at maximum speed occurs at crank position 5 (120 deg.), this amounting to 330 pounds for the former and 385 pounds for the latter. The maximum pressure is therefore about 16 per cent greater in the short-stroke engine. The average pressure on the pistons, found by taking the sum of the pressures for each crank position and dividing by the number of positions, will be found to amount to about 142 pounds in the long-stroke engine and 164 pounds in the short-stroke engine, so that the average piston pressure also is aboout 16 per cent greater in the short-stroke engine.

The piston of the long-stroke engine is 4 in. long. Its projected area is $3\frac{1}{2} \times 4 = 14$ sq. in. For the same unit pressure the projected area of the piston of the short-stroke engine would have to be $1.16 \times 14 = 16.24$ sq. in. The length of the piston would then be $\frac{16.24}{4} = 4.06$ in. The weight of the pistons will be approximately proportional to their surface areas.

The area of the long-stroke engine's piston will be

$$3.52 \times .7854 + 3.5 \quad \times 4 = 48.08.$$

If the piston of the short-stroke engine was 4.06 in. long the total area would be

$$42 \times .7854 + 4 \quad \times 4.06 = 50.99 \text{ sq. in.}$$

As already stated, for the inertia forces to be the same in the two engines, which was the condition assumed in our analysis of the bearing loads, the piston weight, and, theretofore, the area, will have to be inversely proportional to the stroke, so that the area of the short-stroke engine's piston will be

$$\frac{5\frac{1}{4} \times 48.08}{4} = 60.98 \text{ sq. in.}$$

It will thus be seen that the unit pressure on the piston of the short-stroke engine will be lower. When we further take into consideration the fact that at the same number of r.p.m. the main piston speed of the short-stroke engine will be lower than that of the long-stroke engine, it looks as if the piston of the short-stroke engine could be made shorter and lighter without danger of undue wear, in which case the inertia forces would be lower than in the long-stroke engine. This is an important point which is worthy of investigation by experimentation.

With the compression space in the form of a continuation of the cylinder and a compression ratio of 5 to 1, the surface area will be 33.64 sq. in. in the case of the long-stroke engine, and 37.71 sq. in. or 12 per cent greater in the case of the short-stroke engine. Where fairly large valves located in pockets are used, however, the surface area of the compression space will be increased about 44 sq. in. in both cases. This will make the surface areas 77.64 sq. in. and 81.71 sq. in., or about 5 per cent greater in the short-stroke engine.

Just how much variation in m.e.p. will be caused with a given variation in the surface area of the compression space is a somewhat uncertain question, but some interesting figures on this subject were obtained by Mr. Pomeroy in a test of two engines of the same bore and stroke but with a wide difference in compression space area due to the fact the valves were located in the head in one case and in pockets in the other. This test, which was described in a recent issue of **Automotive Industries,** disclosed the fact that the engine with 30 per cent greater compression space area showed a m.e.p. about 14 per cent lower. The amount of fuel consumed by each engine was the same however. Mr. Pomeroy suggests that the difference may be due to incomplete combustion of that part of the charge near the comparatively cool surface of the combustion chamber, the non-effective layer, of course, being greater in the engine with the greatest compression space area.

Relative Engine Weight

Whatever the cause, it is interesting to note that if an increase of 30 per cent in compression space area causes a decrease of 14 per cent in the m.e.p., an increase of 5 per cent in area will cause a decrease of only 2.33 per cent in m.e.p. When we take into consideration the fact that the bearing loads will be somewhat lower in the short-stroke engine at maximum speed, which means that the mechanical efficiency would be somewhat higher, it seems rather doubtful whether there would be any difference in the maximum brake horsepower of the two types of engine.

It is pretty obvious that the short-stroke engine will be lighter than the long-stroke engine of equal piston displacement. Increasing the stroke and decreasing the bore obviously increases the weight of the cylinders, but it easily can be proved that a geometrical cylinder of equal diameter and height contains the least surface area for a given volume.

It also increases the weight of the crankshaft, which must be greater in diameter to accommodate the greater crank throws. The reduction in bore saves little in engine length, because the size of the valves and bearings usually determine this. The crankshaft of the long-stroke engine will be heavier, owing to the greater crank throws, and if balance weights are used these will also have to be heavier. Apparently the ratio of maximum horsepower to weight will therefore be higher in the short-stroke engine. Aeroplane engineers should give more attention to this point.

For a very high-speed, light-weight, high-efficiency engine in particular, the writer believes the short-stroke construction is superior. The connecting rod, which is the most severely stressed member of an engine, and the part most apt to break in racing-car engines, is shorter and more rigid in the short-stroke engine and, therefore, less apt to whip or bow in the middle at high speeds.

The Need for Civil Aerial Transport

This instalment completes the four-part analysis by Doctor Durand of the possibilities and practicalities of transport by air. Taking up nearly every angle, he clearly points the way for this expected development

By Dr. W. F. Durand

THE development of civil air transport along safe and well-ordered lines will require some system of aviators' licenses. The reasons for such requirement are obvious and need not be considered in detail. The fundamental purpose of such license is to insure adequate skill on the part of the would-be pilot, both as a protection to himself and as an insurance of the reliability of the service in which he is to engage. Such license and registration will also serve to list all pilots with reference to matters which may arise involving their legal liability. Licenses should also be required from all persons flying as individuals for sport or pleasure, or as a means of personal transport. This again will be primarily to protect inadequately trained persons against themselves and to list all persons flying in airplanes with reference to matters of legal liability.

With regard to such licenses, the most important practical desideratum in connection with air transport in the United States is that all licenses should be based on a uniform set of requirements and standards, and that a license should be valid in any state in the Union. The requirement of a license for each state over which an aviator may wish to fly would, of course, be intolerable. Some system must be developed under which but a single license will be required, valid over the entire United States. Two methods seem to be open:

(1) To have the issuance of licenses a Federal function, so that all pilots will operate under Federal licenses which are to be accepted as valid in any State in the Union.

(2) To leave the issuance of licenses as a State function, but exercised in connection with the co-operative agency of a Federal body, through whose aid and co-operation, requirements for licenses will be unified and standardized, and whose countersign to a license might be made the basis of acceptance by States other than that in which it was issued.

The latter suggestion seems, on the whole, to be the more workable of the two.

Following this thought, it seems clear that any system which is to be simple, convenient and effective must be uniform in character and requirement, and must not involve the loss in validity of the license by the crossing of a State border; and any system meeting these requirements should have at its center some co-ordinating body, and preferably with Federal authority. At the same time, the individual States will have the right to some voice in these matters, and with reference to legal liability, State legislation will be a desirable feature. These requirements should all be met by a system under which the license will be issued, primarily by the State, but under rules and regulations accepted in common with other States, and when so issued and countersigned by the Federal co-ordinating agency or committee, such licenses by common agreement will be valid in all States.

Any arrangement regarding licenses valid in all the States of the Union will, in any event, require the working out of some form of agreement between the various States on the one hand, and some central co-ordinating Federal authority on the other, and the general plan suggested seems to offer an entirely workable basis for the development of such an understanding.

A further problem remains—that of recognition of such licenses by other nations. So far as the United States is concerned, Canada and Mexico are the only countries into which our aviators are at present likely to fly from a start in the States, at least in any significant numbers. The problem exists, however, and must be met by appropriate provision.

It would appear that for such cases a direct Federal license might be issued by the Federal committee or agency which serves as the centralizing and unifying element among the States. It would then only remain to negotiate an agreement with foreign countries providing for the recognition of such licenses.

Inspection and Classification. The significance of an adequate system of inspection and classification has been already indicated in the formulation of these general problems. The question remains as to what body, agency or authority should exercise this function. With ships and shipping a system has grown up under which the details of inspection and classification are carried on by private organizations, and the rating given as a result of such classification is then accepted by underwriters as a basis for insurance risks. At the same time, governmental authority steps in for all vessels carrying passengers and to some extent for non-passenger vessels as well, and requires the fulfillment of certain conditions directly involving the safety of human life.

Similarly for the case of air transport service, it would appear that at least in the case of proposed passenger service, especially interstate passenger service, governmental authority should intervene with reference to the fulfillment of all requirements directly involving the safety of human life. Here, however, we meet the condition that in the airplane the safety of human life is so

intimately bound up in the design and construction of the plane and its propulsive equipment that it would be very difficult to draw a line short of complete general inspection and approval of design and construction.

Again, for aircraft not involved in passenger service, but intended for interstate traffic otherwise, it would appear that Federal inspection and classification will, all things considered, be most satisfactory and effective. It is true that with the possible future growth of air transport, the number of planes to be inspected and passed may become very considerable. However, the expense of such inspection and classification will be borne by the planes as a part of the general insurance against poor design or improper construction.

The question will then arise as to whether such inspection and classification should be compulsory, and if so, how is it to be made compulsory?

In answer to the first of these queries, and having in view the development of air transport as a well-ordered business undertaking, it does appear that such certification as will be furnished by inspection and classification under Federal rules and by Federal authority is desirable and should be made compulsory, at least in all planes intended for use as public carriers. With such general rule, it would be found that other planes not so employed would naturally seek similar certification, and thus the practice would tend to become, in effect, general.

In order that the taking out of such a certificate be made compulsory, it would seem sufficient to place this entire matter of plane inspection, classification and certification by State license, under the centralizing control of a single Federal body. Such body would then have in executive charge all matters relating to the actual inspection and classification, while it would secure, by agreement among the States, the passage of legislation requiring planes operating as common carriers to take out a State license based on the fulfillment of the requirements and standards laid down by such Federal authority.

For planes operating in interstate commerce, Federal legislation direct could be invoked to secure the taking out of a license covering every plane so used. There would seem to be no difficulty in securing, in one way or another, the necessary legislation requiring a license, and it would then only remain for the Federal agency to work out a common standard of requirement for such license, including inspection and certification.

There would remain certain questions of detail; such, for example, as the division of the license fee between the State and Federal authorities, but none, apparently, offering any insuperable difficulties.

Such a system of inspection, classification and license would then serve, with acquired experience, as a basis for the adjustment of rates to cover insurance on aircraft themselves and their contents while in transit.

Rules of the Road. Safety in navigation will require some definite formulation of rules of the road covering all possible cases of interference or collision between planes. Such rules will be especially required in connection with the approach to and departure from terminal landing fields. There is no occasion here for the discussion of such rules in detail. The important matter at the present time is to recognize their need and to provide for their formulation.

Here, as with other matters involving navigation, license inspection, etc., the intervention of a central Federal authority seems necessary in order to insure uniformity of practice in such matters. Regarding rules of the road in particular, uniformity is of the most vital importance, and a Federal body is the only one through whose agency such uniformity can be assured. The central co-ordinating Federal body suggested at an earlier point in connection with aids to navigation would seem the appropriate body to deal with this subject, and such reference would insure a code of rules of the road which would naturally receive universal acceptance by all forms of air transport service.

The Problem of Liability and the Question of Air Sovereignty. We meet here some of the most knotty problems connected with the rational and well-ordered development of air transport. Only brief reference to certain of the more obvious aspects will be attempted in the present report.

First, as to liability, it is obviously a sound legal principle that damage done by a plane or by a pilot, even if unintentional and due to stress of weather or unavoidable emergency, must nevertheless lie against the plane or pilot causing such damage. In the case of claims for such damage, it will therefore ordinarily be sufficient for the claimant to prove damage. The responsibility, assuming no contributory negligence on the part of the claimant, will then clearly lie against the plane or the pilot. So much seems clear. Certain practical questions, however, may arise. In order to bring suit for damage, the plane or the pilot must be recognized. What means shall be provided for the ready recognition or identification of planes while in flight? Existing practice with automobiles may furnish the suggestion of numbers painted on the lower side of the wings. While the suggestion is natural, such numbers would be relatively far less efficient than in the case of the automobile, even if of very large dimensions. An airplane is often, when banking heavily, in such a position that numbers cannot readily be seen. Again, such numbers at best could be only made out when flying at relatively low levels—at least by the naked eye, and the general public can scarcely be expected to go provided with strong binoculars for use in identifying airplanes passing overhead and through which accident or damage may result to property or life. At high altitudes all identifying marks or characteristics would be entirely lost to the eye, and yet damage may result and the plane or pilot responsible may escape without identification. We have here a situation for which, at the moment, there seems no remedy; but we are, on the other hand, justified in the expectation that such cases will be so rare that they will not count as a factor of any practical significance in the development of air transport service.

However, most damage to the property or persons of others will be likely to arise when the plane is near or on the ground, as in making landings or in rising from the same. Under such conditions an identifying number would be of distinct significance and it will presumably be found desirable to require as a condition for the issuance of a license, that, as with automobiles, each plane carry a registry number of such size as experience may indicate as needful in order to give ready identification of the plane up to moderate altitudes.

The details of such marking should naturally fall within the purview of the Federal body charged with the function of inspection and classification.

This question of liability for damage is again closely interwoven with that of sovereignty or right and title in the air lying above the ground. The old English doctrine declares for the extension of soverignty **usque ad coelum,** a claim which, with the advent of the airplane, must be re-examined and readjusted to existing conditions.

We have here, in effect, two questions:

(1) The question of sovereignty in a natural sense.

(2) The question of ownership or right, title or interest in a private sense.

The first question may be put in a practical form as follows:

At what height must a foreign plane fly above the ground of a given country without coming under the temporary jurisdiction of such country? At what height must a French plane fly over the soil of Switzerland in order to avoid the claim of violation of Swiss neutrality in time of war, or in order to avoid any claim of having visited Switzerland or of having come within the limits of Swiss sovereignty or under the jurisdiction of Swiss law?

Generally speaking and thus far, the doctrine of **usque ad coelum** has prevailed, and during the late war both Holland and Switzerland complained regarding an assumed violation of neutrality by planes of the belligerents flying over Dutch or Swiss territory. It seems clear that a plane flying at an altitude of 50 or 100 feet is clearly within the jurisdiction and under the sovereignty of the state over which it is so flying. Is the same true for 1,000 feet, for 10,000, for 20,000 or higher?

The practical answer seems to be that sovereignty extends just as high as it can be made effective and no higher. And by effective, we may here mean a limit within which means exist for compelling the plane to recognize such sovereignty. Thus, within certain ranges, anti-aircraft gun fire is effective; that is, there exists a fair chance, with a number of anti-aircraft guns, of either hitting a plane or of forcing a detour or an ascent to higher levels. What such altitude is, would be a matter of opinion, but for illustrative purposes we may say that a plane above 15,000 feet will not be in serious danger from anti-aircraft gun fire as now developed. If, then, the effective range of anti-aircraft gun fire be taken as measuring the limit of sovereignty, we may say broadly that a plane flying at greater altitudes does not enter the sovereignty of the state over which it flies.

On the other hand, if a state chooses to develop and maintain a fleet of air scouts adequately armed and prepared to enforce her sovereignty up to an altitude of 20,000 feet or higher, we must clearly grant to her this right, and in such case her sovereignty will extend to the height which her air scouts can effectively cover.

The principle is simple—sovereignty extends as high as it can be made effective. It is elastic and should adjust itself to the proper disposition of all cases which might arise.

One further point should be made clear, and that is that for the purpose of national defense, or for the extension of air sovereignty, every nation must be given the right to extend its sovereignty in the air to such altitudes as it can. In other words, a nation must be considered as having a prescriptive right to extend its sovereignty, especially in a military sense, just as far toward heaven as its military and engineering genius will make possible, and each nation should be ready to yield to others such altitude of air sovereignty as may be thus maintained effective.

Turning now to the question of private ownership or of right, title or interest in the air lying above the earth's surface, we meet with an entirely different condition. The essence of private ownership is the enjoyment of some right, title or interest which such ownership makes possible, or of some work of nature or man which is attached to the ground which such ownership covers. The negative aspect of the matter may be also used to gain a further idea of the correct governing principle to which we must appeal for guidance in these matters. This is that ownership is not impaired provided there is no impairment of any right or title or interest or enjoyment which such ownership is intended to secure. Thus, for example, an airplane flying at an altitude of say 1,000 feet over a private estate will not impair any right, title, interest or enjoyment of the owner. If the flight is at lower altitudes, a level may be reached at which such flight, if often repeated, might become of the order of a nuisance and means should exist for its abatement. On the other hand, the private owner has a right, if he so desires, to erect a tower 1,000 feet high on his property, and if such tower is damaged by a colliding airplane, his rights have suffered and an action for trespass with damages should properly lie against the plane or pilot. Again, the owner may, if he so desires, have attached to the ground on his estate a captive balloon rising to a height of several thousand feet. Damage to such balloon apparently would come under the same rule.

Here, as with national sovereignty, a somewhat analagous rule should apply. Right and title to the air above the surface of the ground should be held to extend as high as it is effectively made use of or as high as may be needful for the insurance of the enjoyment which the ownership of the land is intended to secure—and no higher.

One point in this connection should, however, be made clear, and that is that because ownership of the air should not be held to extend to altitudes beyond those at which it is effectively used or reasonably needful for the proper enjoyment of the ownership of the ground, an airplane flying above such altitude, and causing damage to property or injury to persons, is thereby in no wise relieved from responsibility for such damage or injury. Thus, from an airplane flying in the night at an altitude of 20,000 feet over a greenhouse, a wrench might be dropped, breaking glass and injuring a rare plant. Clearly, the air plane or the pilot must be held responsible. The difference is that, in the one case, the mere passage of the plane, if at a low altitude, might be considered an act of trespass and a suit brought accordingly, seeking to restrain the plane from such further trespass; while in the other, the mere flight could not be considered an act of trespass and a suit would only lie in the case of an actual proven damage, as in the illustration cited.

If these principles regarding air sovereignty and air ownership, which seem sound, are consistently followed, it seems probable that a series of precedents and decisions will develop which will provide adequate legal security for the interests of all parties concerned, and especially for those owners of land over which airplanes are likely to fly.

State Boundaries, National Frontiers and Smuggling.

With the advent of the airplane, able to go at will over the lines which are supposed to mark the boundaries of states or the frontiers of countries, the problem of smuggling becomes one of practical importance. This problem arises in connection with the development of air transport, not in the same way as various preceding problems—as something affecting or conditioning the development of air transport itself, but rather as a problem which will arise in connection with frontier patrol and smuggling, should aircraft become in the future a common means of personal travel. No extended discussion is required to show the facility with which smuggling operations by the use of airplane could be carried on, or the difficulty of adequate frontier patrol and prevention of such operations.

We may note, however, that a frontier air patrol for the prevention of such smuggling is always possible up to the point justified by the economic considerations involved. Further, in so far as the problems might involve a line of common carrier airplanes flying across a frontier from one country to another without stop at the frontier (should such a line ever be developed), it may be noted that the landing fields at the point of descent in such case will be determinate and regular, and passengers can readily be made subject to customs regulations. The dif-

ficulty will not arise, in fact, from aircraft doing regular international business, for such would either naturally have a landing at the frontier or else at known and controlled points within the frontier. The trouble will arise, if at all, with individual operators making use of the airplane as an aid to or factor in smuggling operations. Such possibility must be accepted with the development of air transport; and as noted above, it will always be possible to hold such operations down to small limits by the use of air patrol for the detection and capture of such freebooters of the air.

Economics. The general problem of economics of air transport cannot be treated satisfactorily without more data drawn from experience than is now available. The air mail service which has been under way between New York and Washington for now something more than a year has furnished most valuable information, and when such data can be made more fully available for detailed analysis it will be of great value in the study of economics of air transport problems. Such a study differs in no fundamental principle from that of any other engineering project, and only differs in detail by reason of the very different importance which certain of the factors may assume.

For the purposes of the present report only a brief outline of the subject will be attempted, simply in order to indicate the direction along which the special study of the problem must be made.

The economic study of a project of air transport will involve the following chief factors:

(1) The commodity to be carried, its character and quantity and the distribution of service required throughout the day, week, month and year.

(2) The length of the route and the question of intermediate stops.

(3) The technical characteristics of the plane which it is expected to use, including carrying capacity, horsepower and speed.

(4) The first cost of the same.

(5) The consumption of fuel and lubricating oil per hour at the speed assumed.

(6) The cost of money.

(7) The personnel required as pilots and reserve.

(8) The personnel required as mechanics and repair men.

(9) The personnel required for handling the commodity carried.

(10) The personnel required in connection with auxiliary transport from terminals, if such is necessary.

(11) The material required for such auxiliary transport and its first cost.

(12) The cost of office staff and administration.

(13) The rate of depreciation which must be applied to airplanes and equipment, or otherwise their effective life in the air, including normal wear and accidents.

(14) The amount of excess flying equipment which must be kept on hand at all times and ready for all service, in relation to the equipment in use at any one time. This provision must be adequate to insure regularity of service, having in view the possibility of accidents and the assured need of ordinary upkeep and of regular overhaul and repair. This represents actual investment which must, of course, be secured by an appropriate depreciation reserve.

(15) The rate of depreciation applicable to general property necessary for the project other than flying equipment, and including hangars, buildings, auxiliary transport material, etc.

(16) The cost of casualty insurance on pilots and personnel generally.

(17) The cost of insurance on the commodity carried, if desired.

(18) The cost of licenses for pilots and planes, official registration, etc.

(19) The cost of liability insurance against damage to property or persons by planes or otherwise.

(20) The cost of hangar space at terminals and the charges for the use of landing fields and terminal facilities, or if such terminal facilities are to be provided independently, the cost of the same.

(21) Taxes, municipal, State and Federal.

These various items known or assumed will make possible the estimate of the total expense of operation for a given time as per month, or per year, and classed under the two main heads of

(a) Fixed charges, including interest on capital, depreciation, taxes and generally all charges directly based on the capital invested.

(b) Operation, including actual outlay for salaries, wages and supplies, repairs and maintenance.

Such total cost of doing business per month or per year can then be compared with the commodity which it is expected to carry and a minimum rate per hundredweight mile can be determined as necessary for successful operation from a business standpoint.

If now the entire program be reviewed, assuming a different speed of plane, different weight carrying capacity, etc., in short, a new set of technical characteristics, and the entire problem refigured, a different result will be reached. In this general manner, guided by the results obtained, a gradual approach may be made to such a combination of characteristics as will promise the most favorable results, granting, of course, that the characteristics thus assumed are within the bounds of practical realization.

If one plane only, with fixed technical characteristics, is available, the problem is simplified, since a single traverse of the situation will serve to show, on the assumptions made, the availability or otherwise of such plane for the proposed service.

As compared with other engineering problems of an allied character, the feature which presents the greatest difference is that of the percentage of capital invested in airplanes and flying equipment which must be allowed for depreciation, or otherwise for replacements and renewals.

In certain industrial works of a permanent character, such as concrete dams, power houses and such like constructions, depreciation as low as 2 per cent may be allowed. For machinery in general the rate allowed for depreciation ranges usually between 10 and 30 per cent. For railway rolling stock the rate is of the same general order of quantity.

Where the element of hazard is relatively high, however, and where the rate of normal wear is also high, as with flying equipment generally, the allowance for depreciation reserve must be proportionately greater. From another viewpoint this is a question of the effective life of a machine in the air (normal wear and tear and casualties considered), combined with the assignment of a reasonable length of time in the air as constituting a year's service. Thus if a three-hour trip per day is considered as a fair day's work for a plane, then a year's work will be 1,000 hours in round numbers. The actual investment in planes will, however, include the reserve for accidents and for the relief necessary to permit normal upkeep as noted in (14) above. No one plane will therefore be expected to work all of the time until it is

completely worn out. It will spend its due share of time in repair or rebuilding before final scraping and thus the real questions regarding reserves and depreciation are as follows:

(1) Having in view total flying equipment for current use, including reserves and relief, what fraction of the total time will any one plane on the average be in actual use.

(2) What is the life to be expected of a single plane on the average, including accidents, but also assuming normal upkeep and rebuilding or general overhaul so long as such program may be considered more economical than scrapping and buying new from depreciation reserves.

(3) In view of (1) and (2) what will be the effective life of the investment in flying equipment at any one time, and thus what percentage must be allowed for depreciation reserve in order always to protect and maintain the original investment.

Many other questions of detail will arise in a study of the economics of air transport, but no further development of the subject will be undertaken in the present report.

Military and Naval Significance of Air Transport.

The significance which the airplane has developed as a factor in modern warfare, both by land and sea, marks it as one of the most important of war munitions and insures the deepest interest in the development of aeronautics and the navigation of the air on the part of the military and naval authorities of the Government.

These authorities will therefore have a special interest in the organization and maintenance of training schools for aviators; in the existence of an industrial condition, both as to organization of plant and labor, which will insure adequate supplies for the routine requirements of the military and naval branches of the Government, and permitting of rapid expansion in case of a war demand; in the construction and maintenance of landing fields and flying routes with navigation and route signals, and generally in all advances and improvements in the art of air transport.

In this general connection there are certain questions which may well be made the subject of special examination. They are as follows:

(1) To what extent are the War and Navy Departments, individually or jointly, in a position to subsidize or foster in any manner, directly or indirectly—through some form of air reserve or otherwise—the organization and maintenance of training schools for pilots and the taking of such courses of training by the young men of the country?

(2) To what extent are the War and Navy Departments, individually or jointly, in a position to foster the maintenance of a certain amount of industrial capacity for aircraft production, either by subsidy or assurance of a certain minimum of orders or otherwise?

(3) In what manner can the Military and Naval Departments of the Government be most effectively represented in the governmental boards or committees which the present study seems to indicate as desirable, and to the end that intelligent and helpful co-operation between such governmental agencies on the one hand and the military and naval authorities on the other, may be assured?

The preceding general view has indicated as needful federal boards, committees or agencies to exercise functions relating to:

(1) The inspection, unification and co-ordination of the work of training schools for pilots.

(2) The issue and control of aviators' licenses.

(3) Navigation and navigational aids, including the marking of flying routes, location and maintenance of emergency landing fields, provision of maps, charts and flying directions, issue and control of rules of the road, etc.

(4) Inspection, classification and license of flying material.

Without attempting a detailed analysis or argument, the following proposals seem clear:

(1) So long as we have no central agency of the Government vested with executive authority in matters relating to air transport, it will be necessary to organize such authority within one of the existing executive departments.

(2) Of these the Department of Commerce seems to be plainly indicated for reasons which it is unnecessary to advance here in detail.

(3) The various functions indicated as needful cannot well be realized in detail by the same set of officials in an individual sense.

(4) This seems to point to the organization within the Department of Commerce, of a bureau or executive agency which shall exercise general authority in regard to the federal regulation of air transport, and under which may be organized such subdivisions as may be needful to effectively realize the various functions indicated above.

(5) In order that other governmental departments interested in air transport, such as the Postoffice Department for transport of mails and the Departments of War and Navy for their interest in the general development of air transport (as indicated in the preceding section) may be given adequate representation regarding the measures adopted in connection with these various problems, it would also seem highly desirable that there should be organized a body with legislative functions primarily and representing these various departments of the Government and any others concerned with the development or use of air transport, together with the Bureau of Commerce, and which shall act in a general legislative and advisory capacity with regard to the measures which may be found needful to secure the continued well ordered development of civil air transport as a factor in our national and civic life and as a potential recourse for military and naval needs in time of war.

These are questions of detail, however, which must obviously be studied in Washington and in consultation with the various factors involved. It seems clear, however, that the executive functions should be centered in some one department (and at the present time this should obviously be the Department of Commerce), while the legislative functions should be exercised by a body representative of all the departments and bureaus of the Government which are in any way interested in the development of civil air transport, either for itself or as a factor in military or naval preparedness.

Such a legislative body should also include representation from the National Advisory Committee for Aeronautics, and from the aircraft industry at large.

With this widely representative body for legislative functions and with a single department of the Government to exercise executive functions, it would appear that all interests would have a proper voice in determining the measures affecting the development and control of civil air transport, and that we might look with confidence for a well ordered growth of such means of transport, fully responsive to the conditions of our national life.

Increasing the Scope of Aluminum Alloys

Dependability has come to metal with the realization that the handling in the foundry was necessary in obtaining a reliable product. With reliable control the tensile strength of 20,000 lbs. per sq. in. can be maintained and it is not available for wheels and axle housings with assurance that it will do its work. But for proper working, the material must be considered in design and not selected afterward

By Ferdinand Jehle.

THE tensile strength of the well-known No. 12 aluminum alloy has been given as 20,000 lb. p. sq. in. for a number of years, and in standard test bars this figure was obtained. In regular production, however, it could not be relied upon. Even during the war it was not found possible to hold all foundries to this figure, and the Liberty engine specifications had to be lowered to 18,000 lb. It took some time for those interested to realize that the composition of the alloy was not the only important thing, but that the handling of the metal in the foundry was quite as important. As soon as this realization came, means for the accurate control of melting and pouring were installed in certain well organized foundries. Even the accurate control of these important factors, however, would not guarantee results if the pattern equipment was not suitable.

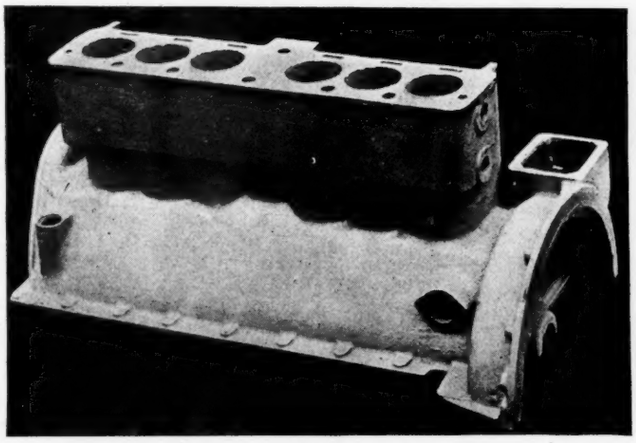


Fig. 1—First aluminum cylinder block

With adequate control in our foundries, 20,000 lb. p. sq. in. can be obtained and maintained in the straight copper-aluminum series of alloys in which No. 12 is classed. If this figure can be relied upon the alloy is quite suitable for engine parts which have been commonly made of aluminum heretofore, but not for parts calling for stronger material.

Tensile strength is not the only physical property which is of importance in motor car construction. If the material is to be used for any structural purpose, it must have rigidity, a property which depends upon the modulus of elasticity. The modulus of elasticity of aluminum alloys in 10,000,000 and that of cast iron 20,000,000 both in round numbers. This means that if we had a cast iron and an aluminum alloy beam of the same dimensions, it would take twice the load to deflect the iron bean the same amount as the aluminum alloy beam.

If we stopped our comparison at this stage we should decide against the use of aluminum, but if we make both beams the same weight and distribute the metal so as to gain the greatest possible advantage, making the aluminum beam two and one-half times as deep as the cast iron one, the deflection of the cast iron beam is practically 7 times that of the aluminum alloy beam. Inversely the aluminum alloy beam is 7 times as rigid as a cast iron one.

In order to make the aluminum alloy beam just as rigid as the cast iron one, the former will be about one and one-fourth times as deep. It will weigh $1.26/2.5 = 1/2$ (Appr.) as much as the cast iron one. We therefore get just as much rigidity from an aluminum alloy structure as we do from a cast iron structure at one-half the weight, provided the metal is distributed correctly. Bearing this in mind we can see that there is no better way of lightening engine crankcases than by using aluminum alloys as the material.

The ductility or the elongation of a material is sometimes of importance. The elongation of cast iron is very low—of the order of one-half per cent. The ordinary casting aluminum alloys have an elongation of about 1½ per cent, whereas certain recently developed alloys run this up to as high as 5 per cent without any reduction in tensile strength. The heat conductivity of aluminum at ordinary temperatures is about three times as great as that of iron. This recommends the material for such parts as oil pans and water jacket walls. Af first it would seem that if a piston or cylinder head, for example, were made of material having a high heat conductivity, considerable power losses would result. It so happens, however, that the skin resistance or surface resistance to heat is about the same for all metals. The heat flow into the piston or cylinder head is therefore largely determined by the exposed area. Having once entered these parts, however, the heat is more rapidly conducted out of them, if the material has a high heat conductivity.

**Extracts from a paper presented before the Cleveland Section, Society of Automotive Engineers*

We have reason, therefore, to believe that an aluminum piston or cylinder head will stay cooler than an iron one. That the temperature actually is less in the former case than in the latter is borne out by the fact that less carbon trouble above and below the piston and less trouble with self-ignition is encountered. To meet the requirement of strength at high temperature, special alloys have been developed for pistons, and still others for such parts as cylinder heads, in both of which cases the ordinary No. 12 alloy would not be desirable.

In 1913 a large manufacturer of engines built thirty with aluminum cylinder blocks. These were painted black so that they could not be distinguished from cast iron and sold as the regular product. The operation of these engines was not different from that of the regular product, and some of the engines are still running. I had the pleasure of conducting tests on one of these engines and on a similar one built entirely out of cast iron. Accurate measurements of the heat losses were made and no difference in these losses was discovered. It is reasonable to expect, however, that in the case of an engine in which the entire combustion space is made of aluminum a somewhat higher compression pressure could be used. Fig. 1 shows this cylinder block and Fig. 2 shows the method used of inserting the cast iron sleeves in which the piston operated.

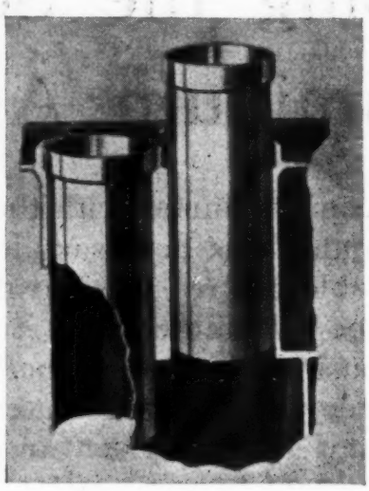


Fig. 2—Showing old method of inserting cast iron sleeves in aluminum body

A few years after these thirty engines had been built, the Marmon Co. came out with an engine constructed almost entirely of aluminum. This was the first commercial all-aluminum engine. Shortly afterwards the Premier Co. placed on the market an engine of similar construction. Both of these engines utilized cast iron cylinder liners. These were installed somewhat as shown in Fig. 2. Later the aluminum was removed from around the cast iron liners, thus allowing the water to come in direct contact with the cylinder wall. This method of inserting the sleeves is shown in Fig. 3.

Fig. 4 shows an engine that was designed at the Lynite Laboratories of The Aluminum Castings Co., involving the use of a great deal of aluminum alloy. The parts made out of aluminum are indicated by letters and named in the list below.

A history of the use of aluminum in gasoline engines would not be complete without mentioning the Liberty engine. The finished engine weighs in the neighborhood of 825 lb. and contained aluminum alloy parts weighing 225 lb. The percentage of aluminum is, therefore, about 27. If all these parts were to be replaced with parts made of iron, it would add approximately 325 lb. to the engine, making

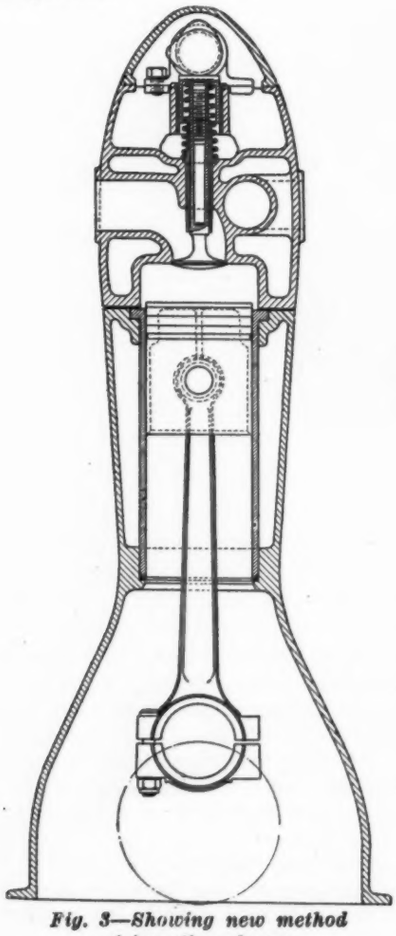


Fig. 3—Showing new method of inserting sleeves

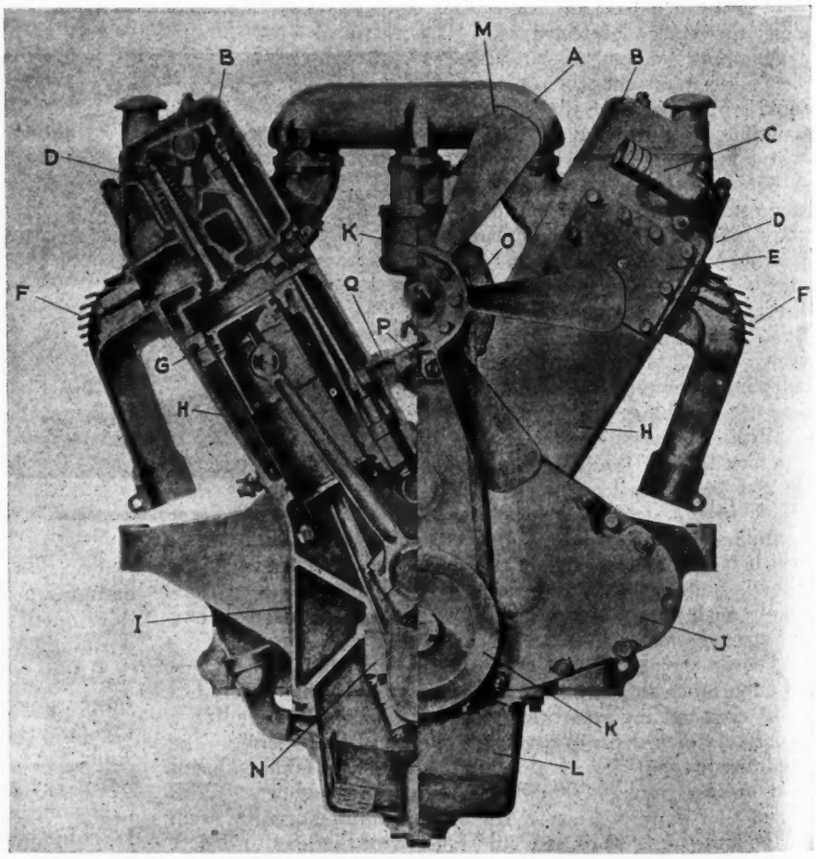


Fig. 4—Aluminum parts of 8A engine

A—Intake manifold
B—Cylinder head cover
C—Cylinder water outlet elbow
D—Cylinder head
E—Cylinder head end cover
F—Exhaust manifold
G—Piston
H—Cylinder
I—Crankcase
J—Timing Gear Cover
K—Fan Pulley (drive)
L—Oil pan
M—Fan
N—Crankshaft bearing
O—Water pump
P—Fan and water
Q—Cylinder water

it weigh 1160 lb.

The use of aluminum alloys in motor car construction need not be limited to the engine. Today, as a result of recent alloy developments, this material can also be used to advantage in transmission cases, differential carriers, worm gear carriers, fans, radiator headers, radiator shells, and a great variety of other parts. The aluminum Castings Co. alone makes castings for something like seventy different parts used in motor car construction. This includes cast aluminum bodies which require still another type of alloy capable to being cast in thin sections of large areas and embodying toughness and ductility. Cast aluminum has certain advantages as a body material. It is light, it is strong, and it presents a hard surface for finishing. Fig. 5 shows a cast luminum body complete with the exception of upholstering and paint.

Thinness of section is generally limited by the ability to cast them and for the time being the thickness of most castings is as light as is commercially possible to produce. Both of the alloys above mentioned (Nos. 112 and 145) drop off in strength quite rapidly at the higher temperatures. For such parts as pistons an alloy has been developed (and in fact has been used for a few years) known as Lynite 122, which will stand up under higher temperatures. The strength of this alloy when cast in permanent molds is 28,000 lb. p. sq. in. while the impact valve is 0.58 ft. lb. and the elongation about 0.5 per cent. The weight per cubic inch is 0.107 lb. When cast in sand the tensile strength of this alloy is less than that of Lynite 145.

An alloy that will withstand considerable pressure is found in Lynite 109 which has a tensile strength of 19,000 lb. p. sq. in. and weighs 0.107 lb. per cu. in. This alloy can be used for water jackets and the like. Where both pressure and temperature must be withstood, as in cylinder heads, a special alloy can be made which combines the properties of Lynites 109 and 122.

Parts Design

The history of the aluminum piston shows that the material must be considered in designing the part. The aluminum piston is here to stay, but we know that not all experience with it has been pleasant. Seventy-five per cent of the trouble, I dare say, was due to the tenacity with which engineers stuck to the design used for cast iron pistons. We have gotten over that and today we design *aluminum pistons*—not just pistons. The experimental work necessary to establish satisfactory design for a piston was considerable, but the effort to sell it to engineers was even greater. Formulae for the design of pistons, for clearance, etc., have all been worked out and are available.

Lynite 145 has made possible the use of aluminum for parts not before made of aluminum alloys. Axle housings have been cast from this alloy and excellent results obtained. This same material has also been used in truck wheels. Several trucks equipped with aluminum disk wheels were tested at the Rock Island Arsenal. The test consisted in mounting the truck on drums which were connected to brakes for absorbing the load when the truck was running. Cleats were placed every 90 deg. on the drum. The truck was operated at 15 m. p. h. which would mean that the tires were struck about 260 times per minute by the cleats on the drums. The impact was sufficient to raise the truck 1½ in. off the drum and it was also sufficient to result in quite a few parts on the truck being broken by vibration. The test was equivalent to 500 miles, and the wheels were all in good shape when the test was completed. The aluminum wheels used in this test weighed 82 lb. apiece, while the steel wheels which were on the truck originally weighed 248 lb., making a total saving of weight of 664 lb.

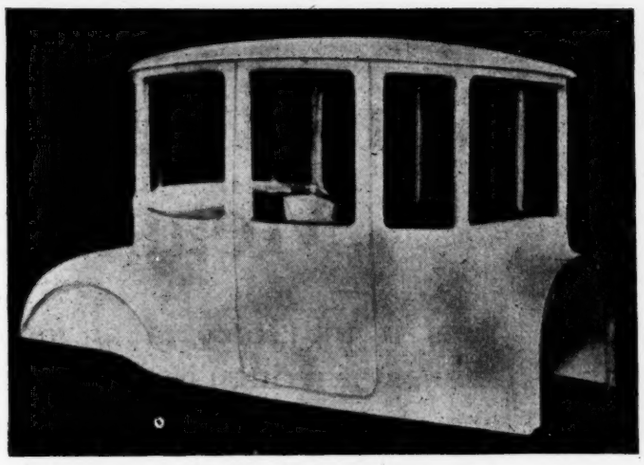


Fig. 5—Aluminum body

Automobile parts already made of aluminum alloys include pistons, crankcases, cylinder blocks, oilpans, inlet manifolds, bodies, etc. It would be folly to try to prophesy to what extent aluminum will eventually be used in motor car construction, but it is safe to predict that during the coming year such parts as wheels, rear axle housings, and the like will be "aluminized."

PROPERTIES OF LYNITE ALLOYS

Alloy	Tensile Strength Lbs. per sq. in. Sand Cast	Impact Values ft. lbs.	Elongation %	Weight lbs. per cubic in.	Use
Lynite 112	20,000	0.76	1.5	0.103	Ordinary castings like oilpans, etc.
Lynite 145	27,500	1.96	4.5	0.106	Castings where greater strength is required, rear axle housings, wheels, etc.
Lynite 122	28,000*	0.58	0.5	0.107	Castings used at high temperatures, like pistons.
Lynite 109	19,000	...	..	0.107	Pressure castings, like water jackets, etc.

*Cast in permanent molds.

Book Review

APPLIED THEORY FOR METAL WORKERS, by Wm. H. Dooley, published by the Ronald Press Co., New York. Price, $2.00.

This is a practical textbook on physics, chemistry, etc., which teaches the principles of science in such a way that the technical or apprentice student will learn to understand the work he does in the shop. It is written in a clear and concise style. Difficult principles are explained in simple language and the interest of the student is maintained by leading him gradually from the elementary to the more difficult phases of subject. Numerous line drawings and photographs add to the value and clarity of the text.

Building a Machine to Measure Ability

This is the story of an interesting organization experiment. While it is written in the form of fiction, it relates an incident in one of the big hurriedly created war business organizations. The promoter of this experiment says that it worked well there and led to some exceedingly interesting discoveries rgarding employes. While it worked in that organization, Automotive Industries is not going to recommend it for older organizations, where precedent has created conditions that do not obtain in a new organization. But, it is worth thinking about

By C. P. Engel

LIKE every other chief executive, the Big Boss prided himself on his ability to "pick" men and he was very jealous of that prerogative. For this special purpose he used to make it a practice to get around the plant a great deal and to become acquainted with the personnel. Whenever a vacancy occurred, it was the rule to fill it by promotion if possible, preferably within the department, and usually the Big Boss personally selected the man.

He believed that this ability to judge men was "a gift," "a bit of genius," and that he had it in an unusual degree. He scoffed at me when I argued that the mob in his office should be selected with the same impersonal, scientific, and machine-like precision that was used in selecting the material that went into his product.

He boasted, without any undue modesty, that he seldom made a mistake, and that ninety-nine out of every hundred men he selected made good. And when I told him that that was entirely within the law of probability because the average man will approximately measure up to the job he is put into, he made no attempt to disprove my theory. He merely argued that the results he was obtaining justified his belief in the method he was using.

I tried again and again to convince him that though the man of his selection was seldom a down-right failure, yet it was probable that just as seldom did he pick the one best man for the particular job. And therefore, while the parts of his internal organization very rarely broke down as a result of his choice, all that he was getting was average results from the average men he selected. That, moveover, it was entirely probable that by selecting the best possible men he might be getting the best possible results and, in addition, eliminate any chance of a break-down.

He didn't give my theories any serious consideration until Marsden's utter failure shocked him into a realization of the fact that his judgment was only human. A competitor having stolen the head of his order department, he promoted Marsden. Now Marsden was a likeable fellow, with a pleasing personality, a suave manner, and he was ideally suited for the job he had been holding where his chief duties were to act as a sort of a buffer for his chief. But Marsden was exceedingly high-strung and nervous, and whenever he was called upon to assume any responsibility he lost his head. Besides, he really knew very little about the working of the department. But how was the Big Boss to know all this? He had talked to Marsden not over a dozen times, and usually it was when Marsden had gone to him regarding some one point, and, being all primed, had been able to talk fluently and intelligently about it. So he gave the impression of knowing his business. The Big Boss liked his manner and when the head of the department went, it was natural that the infallible "genius" of the Big Boss had told him that Marsden was the ideal man for the place.

But no sooner was Marsden head of the department than trouble began. Dissatisfaction, and rumors of "pull" spread through the department. The other clerks, though they liked Marsden, knew that he was not competent to fill the position, and that there were at least four other men in the department who were. The result was that in spite of his really excellent qualities, good intentions, and earnest effort, Marsden got resistance from the other men instead of co-operation. His work slid away from him, lack of co-ordination

with other departments soon became apparent, and the whole organization began to feel the ill effects.

It took the Big Boss about six weeks to get wise. When he added up the cost, he found a general disturbance throughout the organization and chaos in the order department, directly resulting in the loss of two good customers and the dissatisfaction of several others. He was afraid to take a chance on someone else from the department so he had to go outside and pay a big price for an experienced man to come in and reorganize the department for him. Also, since Marsden was the type who never would have stood being demoted, he had to let him go. This was a real loss, too, because Marsden was a very efficient man in his own way and it was not so easy to replace him.

It was after this experience that for the first time the Big Boss was willing to give my theories serious consideration. I told him he had been fooling himself for many years, that he was no better able to pick out men than anybody else. He had been considerably humbled by his recent experience so he didn't throw me out. I showed him how Marsden was only an exception in that he had less than the average amount of adaptability. Then I quoted one case after another of men in his plant, selected by him, and I pointed out that in every instance an ordinary man with average intelligence and ability, who was willing to work, could have done just as well.

Then he threw up his hands and told me to go ahead. Usually I do my work from the outside, but as this was the biggest job of its kind I had ever tackled, I decided to move right in and give it all my time until I had gotten it well under way, and had thoroughly converted the Big Boss to my theory.

Now my theory was founded on the premise that the chief executive of any organization can never form a true judgment of any of the individuals of his organization except his personal associates, because he can see little or nothing of their daily work no matter how definitely he may try. Even the judgment of the chief of a department, or the head of a unit, should not be trusted because even he cannot get into sufficient frequent and intimate contact with the members of the group.

But the individuals of a group can judge each other. Men and women working together, hour by hour, unconsciously reveal themselves, their real abilities, possibilities, faults and drawbacks, and unconsciously each is absorbing an impression of all the others. In order to get a true measure of the characteristics of the individuals in a group, it is only necessary to encourage them to express the opinions of each other that they have already formed, to train them in their observation of each other, and to show them how to express their judgments.

When I had taken my place in the Big Boss's organization, the first thing I did, after selecting the department to be experimented upon, was to call a meeting of all of the members of the department including the heads. There were twenty-eight in all—men and women. We had an informal discussion covering the work of the department, a detailed outline of its duties, its concrete purpose as a department, its place in the work of the corporation, and exactly how it functioned into the activities of the various other departments. We then discussed the general characteristics required in individual men and women for the work of the department and its various units. It was very interesting to see how little thinking had evidently been done along these lines by the members of the department, and how widely different were the various suggestions offered. After much discussion, the meeting finally agreed upon three characteristics as being most essential to a 100% worker in any part of the department. The three selected were personality, accuracy and industry.

EXPERIMENTAL BALLOT

RATINGS OF EMPLOYEES OF THE PHOTOPRINT BRANCH BY THEMSELVES

MY NAME APPEARS IN GROUP _____ (1, 2 or 3)
AS GIVEN BELOW

DATE 1919

NAMES	RATINGS ON BASIS OF 100%				
Group 1	PERSONALITY	ABILITY	INDUSTRY		
Mr Basil L. Harlow					
Mr H.W. Kidder					
Group 2					
Mr. E.M. Bliss					
Mr. A.W. Casper					
Miss M.G. Dunn					
Mr. H.G. Hawkins					
Mr. Wm. Hennesey					
Mr. C.A. Matthieu					
Mr. Ralph Speakman					
Mr. J.A. Swanson					
Group 3					
Miss Miriam Brumfield					
Miss Loretta Cooney					
Miss Marion Dapp					
Mr. E.C. Davis					
Miss Kathryn Eisenhurth					
Mr. Lee Feltwell					
Mr. W. Gee					
Mr J. Gentner					
Mr. John Hayes					
Mrs. Helbling					
Mr. H. Hicks					
Mr. Chas S. Howell					
Miss Irma Johnson					
Mr. A.W. Lambdin					
Miss Margaret Macay					
Miss Jean Miller					
Mr. J.P. Mullen					
Mr. E. O'Connell					
Mr. Elmer Pollock					
Mr. W.J. Quigley					
Mrs. Helen M. Sharp					
Mr. Norman Smith					
Miss Margaret Thompson					
Miss Line Van					
Mr. J. Archer Vernon					
Mr. A.D. Warden					
Mr. A. Weaver					
Miss Ellen Wharterby					
Miss M.E. Wolf					

By that time they were all aroused and interested. Then I took active charge of the meeting and did all the talking. I told my people that having themselves selected three qualities which they considered vital to their successful work, it would not only be interesting but also of great value to each and every one of them to find out just how he or she measured up to these qualities in the opinion of their co-workers in their department; not only the average opinion of all their co-workers, but also the average opinion of their superiors, of their equals, and of their inferiors. I showed the immediate benefit that would accrue, for instance, to a man who on "personality" was judged 90% by his superiors, 80% by his equals and 65% by his inferiors. These judgments would tell him that, unconsciously perhaps, he was arrogant and short with his inferiors and might explain to him why he had trouble getting things done. He would then have knowledge that would enable him to corerct his fault and make himself more valuable to himself and to

the company—such knowledge as the average judgment of the whole department could not give him.

By that time, my audience was convinced that this information would not only be very interesting but also very valuable to them. Then I announced that we would have a vote, each one, including the heads, voting for all of the twenty-eight including themselves, so that it would be a secret ballot, with no chance of anybody tracing even a single vote.

Now this first vote came to these men and women as something absolutely new—a surprise. I had arranged it that way purposely. I did not want to give them time to find all sorts of faults with the system, to imagine that it was a new way for the company to find out things to their detriment, etc. And with that idea in mind, I had let the meeting drift and had encouraged everybody to talk freely until after they had chosen the three characteristics. Then I rushed matters, and before they had time to think it over, I had swept them along with me, distributed the ballots, and the first vote had been cast and recorded.

When I announced that we would vote I had the ballots all ready. The names of the members of the department had been typewritten in the first column, and the other columns had been numbered. It was only necessary to assign one of the numbers to each one of the three characteristics chosen, and to have each individual mark the ballot indicating which group he belonged to. There were three groups. Group 1 was made up of the heads and assistant heads of the department and its branches—the executives; Group 2 included all the major clerks of the department as distinguished from Group 3, which covered assistants, office boys and beginners.

After averaging the ballots, I distributed to the members of the department copies of the result. One vote was not only interesting but well worth noting. In the "personality" column, the assistant head received twenty-seven votes ranging from 65% to 95% and one vote of 20%, and the ballot which marked him 20% on "personality" also marked him way down on "industry" and "ability." I threw out this vote and averaged the other twenty-seven for the assistant head. When I distributed the averages, I warned everybody that personal grudges would have to be eliminated, pointing out to them that this voting system was for their benefit, and that in order to profit by it they would have to be absolutely honest in their votes. I exlained that it was perfectly possible for a man to be rude, snappy, disagreeable, etc., and to warrant a low personality vote, and still be very able and industrious. I made them understand that they owed it to themselves to consider these things carefully and make their votes a true reflection of their opinions; for, if spite voting were indulged in, it would be no time before individuals would think, "Well, he's going to vote me down so I'll get even and vote him down." And I pointed out that if this sort of thing happened, the results of the voting would be of no value either to themselves or to the company.

Next I announced that there would be another vote in a week. The results of the first vote were eagerly studied and a great deal of interest was manifested. They got together by twos and threes and in groups to talk it over and several times individuals and groups came to my office to ask questions and discuss details regarding the vote.

They drew up definitions of just what they understood "personality," "ability" and "industry" to mean. And they proposed amplifying these definitions by adding to the three characteristics chosen, others, such as knowledge of the business, familiarity with the stock, speed of handling work, ability to quickly grasp a situation or condition, ability to quickly come to a correct conclusion, etc. I suggested that since the result of these ballots would later influence the choosing of executives, we add such characteristics as dignity, ability to command respect, ability to get work out of people, etc.

The most startling fact revealed by the second vote was that in just one week's time the individuals as a whole had become much more observant and more accu-

ABILITY

RATINGS OF PHOTOPRINTS BRANCH EMPLOYEES

BY THEMSELVES AS OF MARCH 4, 1919

(Where there is only one estimator in a particular rank, the "average estimator" is not shown; an "average" must be the result of two or more estimates, in order that no individual's estimate may be known. The names are arranged in order, beginning with the highest total average rating.)

Rank	Group	Name	Total Estimators	Total Average Rating	No.Est. Higher Rank	Average Estimate	No.Est. Equal Rank	Average Estimate	No.Est. Lower Rank	Average Estimate
1	1	H. W. Kidder	30	92.20	-	-	-		30	92.20
2	3	A. W. Warden	16	89.06	6	86.66	10	90.80	-	-
3	3	Miss Wolf	12	87.50	6	89.16	6	86.16	-	-
4	2	Miss Dunn	28	87.10	2	91.00	5	83.20	21	86.30
5	2	F. W. Bliss	22	86.82	2	92.50	7	87.14	13	85.77
6	3	C. H. Howell	16	86.13	5	86.80	11	85.00	-	-
7	3	Marion Depp	12	85.29	6	85.00	6	85.50	-	-
8	2	J. A. Swanson	28	85.00	2	90.00	7	78.00	19	86.10
9	3	Miss Eisenhuth	13	84.15	7	85.71	6	82.35	-	-
10	3	H. Hicks	19	83.94	6	82.50	13	84.46	-	-
11	3	W. Ore	18	83.13	7	82.85	10	83.50	-	-
12	3	Lina Van	25	83.36	8	75.37	17	87.11	-	-
13	3	A. W. Lambdin	17	83.33	8	88.12	9	79.44	-	-
14	3	John Hayes	18	83.00	9	83.33	8	83.12	-	-
15	3	Miss Brumfield	13	82.30	6	84.66	7	80.28	-	-
16	3	J. A. Vernon	22	82.18	9	87.58	13	78.46	-	-
17	2	Ralph Speakman	24	81.83	2	87.50	6	76.83	16	82.37
18	2	Wm. Kennesey	25	81.40	2	86.50	6	82.17	17	80.82
19	3	Helen M. Sharp	15	81.33	6	83.00	7	77.14	-	-
20	3	Miss M. Macky	17	81.17	7	78.57	10	83.00	-	-
21	3	Miss Whartenby	14	80.93	5	85.00	10	77.87	-	-
22	2	A. W. Casper	22	80.91	3	90.00	5	81.80	14	79.33
23	3	M. O'Connell	22	80.91	7	79.28	15	81.93	-	-
24	3	Miss Thompson	24	80.66	7	80.00	17	82.12	-	-
25	1	Basil L. Harlow	30	79.90	-	-	-	-	30	79.90
26	3	H. C. Hawkins	27	79.40	2	87.50	7	81.42	18	77.72
27	3	Loretta Cooney	27	79.12	10	72.40	17	83.12	-	-
28	3	A. W. Weaver	24	78.87	8	78.12	14	79.28	-	-
29	3	J. F. Mullen	23	77.87	9	81.66	14	78.43	-	-
30	3	W. J. Quigley	19	76.68	9	69.00	10	79.80	-	-
31	3	Mrs. Helbling	17	75.17	6	81.33	11	71.81	-	-
32	3	Irma Johnson	15	74.86	8	74.25	17	73.19	-	-
33	2	C. A. Matthieu	25	74.48	2	90.00	6	83.33	17	63.64
34	3	Norman Smith	14	73.94	7	78.00	7	70.28	-	-
35	3	E. C. Davis	19	72.84	6	85.17	13	67.92	-	-
36	3	Elmer Pollock	18	72.50	7	78.14	9	72.77	-	-
37	3	J. Gentner	19	71.36	7	74.00	12	70.00	-	-
38	3	Lee Feltwell	14	68.21	6	74.16	8	63.75	-	-
39	3	Jean Miller	14	67.14	7	67.86	7	66.43	-	-
		TOTAL AVERAGE	774	80.72	222	82.34	377	79.10	195	81.82

Result of original "Ability" ballot

ABILITY

RATINGS OF PHOTOPRINT BRANCH EMPLOYEES

BY THEMSELVES AS OF APRIL 10, 1919

(Where there is only one estimator in a particular rank, the "average estimate" is not shown; an "average" must be the result of two or more estimates, in order that no individual's estimate may be known. The names are arranged in order, beginning with the highest total average rating.)

Rank	Group	Name	Total Estimators	Total Average Rating	No.Est. Higher Rank	Average Estimate	No.Est. Equal Rank	Average Estimate	No.Est. Lower Rank	Average Estimate
1	1	H. W. Kidder	23	88.87	-		-		23	88.87
2	2	J. A. Swanson	24	87.33	2	92.50	9	88.00	13	86.23
3	2	F. W. Bliss	21	86.24	2	92.50	5	85.60	14	85.57
4	3	Miss Eisenhuth	10	85.00	6	86.66	4	82.50	-	-
5	3	Miss M.E.Wolf	7	85.00	5	85.00	2	85.00	-	-
6	3	C. H. Howell	14	84.29	5	86.40	9	83.11	-	-
7	3	A. W. Warden	16	83.93	6	83.00	10	84.50	-	-
8	2	Miss M. G. Dunn	21	82.76	2	92.50	4	77.50	15	80.67
9	2	R. Speakman	20	81.70	2	91.50	4	83.50	14	79.79
10	3	H. Hicks	16	81.62	6	78.50	10	83.50	-	-
11	3	Miss W. Brumfield	7	80.71	4	85.25	3	76.66	-	-
12	3	Miss L. Van	20	81.40	5	82.60	15	81.00	-	-
13	3	J. Hayes	18	81.33	7	81.14	11	81.48	-	-
14	3	Miss I. Johnson	12	80.83	7	80.71	5	81.00	-	-
15	2	A. W. Casper	21	80.76	2	90.00	4	77.50	15	80.16
16	3	Miss M. Macky	15	80.66	5	82.00	10	80.60	-	-
17	3	J. A. Vernon	16	79.93	7	82.00	9	78.33	-	-
18	3	A. W. Lambdin	14	78.64	6	85.00	8	79.37	-	-
19	3	Miss M. Depp	8	78.12	6	80.83	2	70.00	-	-
20	3	Miss Whartenby	11	77.84	5	79.00	6	76.33	-	-
21	1	B. L. Harlow	21	77.04	-	-	-	-	21	77.04
22	2	Wm. Kennesey	23	76.86	2	89.00	5	73.00	16	75.18
23	3	J. F. Mullen	18	76.44	7	79.00	11	74.82	-	-
24	3	Miss L. Cooney	22	76.27	7	71.43	15	78.50	-	-
25	3	W. J. Quigley	17	75.88	5	78.00	12	76.25	-	-
26	3	J. Gentner	11	75.45	5	82.00	6	70.00	-	-
27	3	Mrs. Helbling	12	75.25	5	79.80	7	72.14	-	-
28	3	E. O'Connell	18	73.69	5	74.60	11	73.18	-	-
29	3	W. Ore	16	73.12	7	72.71	9	74.44	-	-
30	2	C. A. Matthieu	19	73.05	2	91.00	4	76.25	13	69.61
31	3	E. C. Davis	19	70.94	6	78.00	13	67.69	-	-
32	3	Miss J. Miller	11	69.54	6	77.50	5	60.00	-	-
33	3	E. Pollock	18	68.05	5	69.00	13	67.69	-	-
34	3	N. Smith	12	66.66	6	75.00	6	58.33	-	-
		TOTAL AVERAGE	549	76.96	150	80.63	243	76.53	145	81.18

Result of ballot taken five weeks later

PERSONALITY

RATINGS OF PHOTOPRINT BRANCH EMPLOYEES

BY THEMSELVES AS OF APRIL 10, 1919

Where there is only one estimator in a particular rank, the "average estimate" is not shown; an "average" must be the result of two or more estimates, in order that no individual's estimate may be known. The names are arranged in order, beginning with the highest total average rating.)

Rank	Group	Name	Total Estimators	Total Average Rating	No.Est. Higher Rank	Average Estimate	No.Est. Equal Rank	Average Estimate	No.Est. Lower Rank	Average Estimate
1	3	Miss Eisenhuth	10	86.20	6	89.50	4	81.25	-	-
2	2	J. A. Swanson	24	86.17	2	91.00	5	86.00	17	85.65
3	1	H. W. Kidder	23	84.69	-	-	-	-	23	84.69
4	2	Miss M. G. Dunn	23	83.80	2	90.00	4	81.25	17	83.41
5	3	Miss M.E. Wolf	7	83.57	5	83.00	2	85.00	-	-
6	3	Mr. H. Hicks	17	83.11	6	82.16	11	83.64	-	-
7	3	Miss L. Cooney	22	82.59	7	75.57	15	85.87	-	-
8	3	Miss Lina Van	21	82.29	5	84.60	16	81.56	-	-
9	3	C. S. Howell	14	82.17	6	80.83	10	83.00	-	-
10	2	A. W. Casper	22	81.98	2	89.50	4	86.25	16	79.44
11	3	Miss I. Johnson	12	81.50	7	79.71	5	84.00	-	-
12	3	John Hayes	18	80.83	7	81.28	11	80.55	-	-
13	2	F. M. Bliss	21	80.48	2	88.50	5	79.00	14	79.86
14	3	A. W. Lambdin	14	79.86	6	83.50	8	75.62	-	-
15	3	A. D. Warden	17	79.71	6	77.50	11	80.91	-	-
16	3	Miss M. Brumfield	7	79.00	4	82.00	3	78.00	-	-
17	3	J. A. Vernon	17	79.00	7	79.71	10	78.50	-	-
18	3	Miss M. Depp	8	78.75	6	81.67	2	70.00	-	-
19	1	R. L. Harlow	23	78.30	-	-	-	-	23	78.30
20	2	R. O'Connell	14	77.21	5	78.00	11	77.09	-	-
21	3	Miss M. Macay	17	77.20	6	78.00	11	77.27	-	-
22	2	R. Speakman	20	76.35	2	80.00	4	78.75	14	75.14
23	3	Mrs. Helbling	12	75.83	5	77.00	7	75.00	-	-
24	3	Miss Wmartenby	11	75.73	5	76.00	6	75.50	-	-
25	3	W. J. Quigley	18	75.11	5	75.40	13	75.00	-	-
26	3	W. Gee	16	74.69	7	73.57	9	75.56	-	-
27	3	E. C. Davis	20	73.40	6	80.00	14	70.57	-	-
28	3	J. F. Mullen	19	73.21	7	78.57	12	70.08	-	-
29	3	E. Pollock	18	72.00	5	71.00	13	72.69	-	-
30	2	Wm. Hennessy	24	71.79	2	75.00	5	70.00	17	71.94
31	3	J. Gantner	11	71.36	5	76.00	6	67.83	-	-
32	3	H. Smith	13	70.88	6	75.17	7	67.14	-	-
33	3	Miss J. Miller	11	70.45	6	78.33	5	61.00	-	-
34	2	C. A. Matthieu	20	69.25	2	90.00	4	66.25	14	67.14
		TOTAL AVERAGE	567	78.38	189	79.81	283	77.12	105	78.89

INDUSTRY

RATINGS OF PHOTOPRINT BRANCH EMPLOYEES

BY THEMSELVES AS OF APRIL 10, 1919

(Where there is only one estimator in a particular rank, the "average estimate" is not shown; an "average" must be the result of two or more estimates, in order that no individual's estimate may be known. The names are arranged in order, beginning with the highest total average rating.)

Rank	Group	Name	Total Estimators	Total Average Rating	No.Est. Higher Rank	Average Estimate	No.Est. Equal Rank	Average Estimate	No.Est. Lower Rank	Average Estimate
1	2	J. A. Swanson	24	87.21	2	93.50	5	91.00	17	85.36
2	2	F. M. Bliss	21	86.24	2	93.50	5	90.80	14	83.57
3	3	C. S. Howell	14	84.14	5	88.60	9	83.33	-	-
4	3	A. D. Warden	15	83.66	6	76.67	9	88.33	-	-
5	1	H. W. Kidder	22	83.18	-	-	-	-	22	83.18
6	3	Miss Eisenhuth	10	83.00	6	85.00	4	80.00	-	-
7	3	Mr. H. Hicks	16	82.19	6	80.00	10	83.80	-	-
8	3	Miss M. E. Wolf	7	82.14	5	81.00	2	85.00	-	-
9	3	Miss Lina Van	20	81.50	5	80.00	15	82.00	-	-
10	3	Miss M. Brumfield	7	81.43	4	85.00	3	76.67	-	-
11	2	Miss M. G. Dunn	21	80.33	2	90.00	4	78.25	15	80.20
12	3	Miss M. Macay	15	80.33	5	81.00	10	80.00	-	-
13	3	A. W. Lambdin	14	80.14	6	84.50	8	76.87	-	-
14	3	Miss I. Johnson	12	80.00	7	78.57	5	82.00	-	-
15	3	J. A. Vernon	16	79.81	7	83.14	9	77.22	-	-
16	2	A. W. Casper	21	79.33	2	90.00	4	80.00	15	77.93
17	3	John Hayes	18	79.22	7	79.00	11	79.36	-	-
18	3	Mrs. Helbling	12	78.75	5	83.00	7	75.71	-	-
19	3	Miss Wmartenby	11	78.45	5	81.00	6	76.33	-	-
20	2	R. Speakman	20	78.10	2	80.50	4	80.00	14	76.93
21	3	R. O'Connell	15	77.33	5	75.00	10	78.50	-	-
22	3	J. F. Mullen	18	77.00	7	84.71	11	72.09	-	-
23	1	R. L. Harlow	21	76.24	-	-	-	-	21	76.24
24	3	Miss M. Depp	8	76.00	6	77.17	2	72.50	-	-
25	2	Wm. Hennessy	23	75.91	2	89.00	5	75.00	16	74.56
26	3	W. J. Quigley	17	76.59	5	74.00	12	76.25	-	-
27	3	W. Gee	16	75.50	7	76.14	9	75.00	-	-
28	3	J. Gantner	11	75.27	5	81.60	6	70.00	-	-
29	3	Miss L. Cooney	22	74.77	7	70.71	15	76.67	-	-
30	2	C. A. Matthieu	19	73.26	2	90.00	4	71.25	13	71.31
31	3	E. Pollock	16	71.25	5	75.00	11	69.55	-	-
32	3	E. C. Davis	19	69.63	6	77.50	12	66.00	-	-
33	3	H. Smith	13	68.69	6	75.83	7	62.86	-	-
34	3	Miss J. Miller	11	68.27	6	75.83	5	59.20	-	-
		TOTAL AVERAGE	544	78.81	156	80.26	240	76.95	147	79.03

"Personality" and "Industry" Ballots

rate in their judgments. This was clearly indicated by the fact that the second vote in every instance showed a smaller variation between the high and low vote on each of the characteristics for each individual. In one case, the first vote on one fellow's personality had varied from 55% to 95%—a variation of 40%, and the second vote had ranged from 75% to 93%—a variation of only 18%.

This proved that the entire personnel of the department were observing more closely and forming more accurate judgments of each other, and therefore each one in his vote was getting closer to the real truth.

Another interesting story told by the second vote was the relative standing of the department head. In the first vote, his percentage in each of the characteristics was highest, and he headed the list. I don't know whether that was complimentary to him as head, or whether everybody had assumed that being the head he necessarily was the best man. But I do know that on the second vote, he came out third in "ability," seventh in "personality," and twenty-second in "industry."

By this time one wholly unhoped for and unsuspected result had become apparent. There was a remarkable improvement in the work of the department as a whole, as well as in the work of almost every individual member of the department.

I figured it out this way. Everybody likes to have a good batting average, and after the average results of the first vote had been given out, and another vote had been announced to take place in a week, each of those twenty-eight people began to realize that, with his every action, his associates were forming judgments that were going to affect his average. He grew more careful about what he did and how he did it. A lot of internal friction disappeared, and the department ran much moore smoothly. And from studying and observing each other, and realizing that they were being studied, it was only a step for the members of the department to become introspective and study and observe themselves.

The company had always had a suggestion box, a standing monthly prize for the best suggestion, and cash payments for every suggestion adopted. But it was truly remarkable to see how many suggestions came forth at our successive meetings from men and women who had never contributed to the suggestion box. The stimulating effect of these meetings, and the general discussions, added to the personal pride of each one in his own batting average, had gotten them to thinking about their work more intensively, and to making suggestions more freely, than any mere offer of a cash prize ever could have done. Some of these suggestions were mighty good, were approved, adopted, and put into operation. And these new methods, thus initiated and adopted after discussion by the members themselves, were carried out with more co-operation and with better spirit than any previous changes that had ever been introduced in the department.

Because of the satisfaction and enthusiasm which had resulted in the first department where the experiment had been tried out, the news had traveled ahead of me, and other departments were not only ready but eager to have me start the voting system with them. In some cases, they had already discussed it among themselves and had quite clearly defined ideas of what they wanted to vote upon.

The system was rapidly extended to the other departments. The higher morale of the rank and file, their increasing interest in their jobs, and the improveemnt in the work of the whole corporation, everywhere followed the introduction of the system.

Votes are now held monthly in each department and, as a result, we have a complete record giving an absolutely infallible measurement of the characteristics, abilities and possibilities of every employee of the corpora- haphazard guess, but the best man is chosen for that tion. When there is a promotion to be made, there is no haphazard guess. The best man gets it.

The Real Danger Signal of the Coal Strike

No, it was not a threatened fuel shortage. We knew about that danger all of the time. In this article Mr. Tipper shows that the one important development was the demonstration that both employers and employees are declining to take the other into confidence as to the future and that both ignore the other until such a time as it is necessary to place the cards on the table, and then each expresses more or less surprise. This situation, Mr. Tipper says, can only be avoided by the employer keeping in touch at all times with his working associates

By Harry Tipper

THE circumstances concerning the coal strike, the attitude of the miners previous to that strike, the attitude of the coal operators, the final arrangements for the strike, the action of the attorney-general and the final development, indicate very thoroughly the ineffectiveness of present organization methods in dealing with the situation, the effect of public opinion upon the conditions in industry and the meager information upon which public opinion is obliged to make its decision.

Were it not for the disastrous consequences, the sudden realization of difficulty in the coal business would be laughable. As it is, it must stand as a severe criticism of our ability to organize for industrial purposes. Although the differences between the coal miners and the coal operators have been accumulating steadily for two or three years, there was practically no discussion of the subject at all, until the miners' demands were formulated and the conference failed to arrive at a decision.

Even when the matters had reached this critical stage, the discussion in the public press indicated a lack of knowledge in regard to the detailed conditions in the various mine fields and a general tendency to decide the merits of the controversy from preconceived opinions as to the capacity of the leaders and the men involved.

There is something very wrong with an industrial organization which can do nothing but wait until the grievances have solidified themselves into a definite disagreement, and which cannot therefore begin to operate until the possibility of agreement is almost past. There is not a coal operator in the business who can be entirely ignorant of the opinion of the miners and the fact that they have been growing restive under the conditions of work for a long period. There is not a leader in the union ranks of the miners who has not been aware of the consolidation of opinion as to the grievances and as to the necessity of their removal. Despite this knowledge of the growing difference of opinion between the workers and the owners in this essential industry, there is no evidence that any real effort was made on either side to get together, to understand the viewpoint of the other party or to arrive at a solution.

The danger of such a strike naturally alarmed the public and the effect of this alarm was seen in the rapid action of the government, once the strike was instituted. It is seen in the withdrawal of sympathy from the miners. It should be noted, however, that agreements effected under such conditions do not improve the relations between the management and the workers, do not safeguard the public interests and do not remove any of the bitterness which always arises out of a disagreement of this kind.

The peculiar circumstances involved in this strike have added to the confusion and unquestionably increased the bitterness, during the war. The Lever Act, which was passed in order to give power to the Food and Fuel Administration, carried specific provisions which would enforce the authority of these departments and keep the production and distribution of such products at a maximum. This act was created for the purpose of war, and its provisions were limited to the term of war.

The operators, in their conference with the coal miners, claimed that the contract made between the parties under this act was still in force and that no new contract could be negotiated until such time as the war was finally terminated. Miners claimed that the purpose of the act was to fulfill the necessities of the war and as the necessities of the war had passed away with the armistice, the act was no longer in force.

When the strike occurred, the attorney-general moved for an injunction against the striking miners under the terms of the act, and was upheld temporarily by Judge Anderson in his ruling at Indianapolis.

Unfortunately, the action of the attorney-general and the action of the judge has been misconstrued by unions and industrial owners who have given the matter hasty consideration only.

The statements of Mr. Gompers, leader of the American Federation of Labor, and other union leaders, and the

statements of manufacturers, indicate that on both sides the action is viewed as having a general application to strikes in labor disputes in essential industries. This is not true.

Of course, the action of the government and the decision of the judge arises out of the particular terms of this act and relate only to the conditions of this strike. Neither the action of the attorney-general nor the temporary injunctions which were granted have anything to do with the government position or the legal aspects of strikes in general, or of any other strike, save this particular one.

There is no question that it would have been better for the coal miners and the coal operators if this injunction could have been avoided and an agreement reached without it. It is probable that it would have been better for the general industrial condition if the situation had not become so acute.

As it is, conservative labor opinion is irritated by the use of this legal method of ending the strike. There is a suspicion that the final decision was based upon a technicality, and there is a fear that an attempt may be made to consider the matter as a precedent which can be used in other cases. On the part of the industrial managers who are not concerned with the solution of the problem, but are among those who desire nothing but the status quo, this decision has raised a hope that they may be able to stand against any further concessions with unions and use the present public irritation to consolidate their own position with regard to its permanent value.

The very fact that the public is being irritated by the constant succession of strikes and by the internal labor politics which have destroyed its orderly movement, suggests the danger of merely securing (by virtue of public opinion and the necessity for production) a surface orderliness which will not satisfy the conditions and which will not add one iota to the solution of the problem.

The problem remains, with the additional bitterness which comes wherever disagreements are allowed to consolidate into demands and precipitate a fight. Defeat of the workers may cause the elimination of the demand, but it will not lay the foundation for any improvement in conditions and it will only defer the demand until the defeated party can accumulate sufficient strength to offer a prospect of a better outcome.

While it is necessary that the unreasonable demands of labor should be defeated and production increased to the greatest degree consistent with health, it is unfortunate that our organization in industry is so totally deficient in its capacity for human government that the demands can only be defeated by fighting and cannot be eliminated by orderly agreement. Whenever a serious attempt is made to discover the net consensus of opinion of the rank and file of workers involved in any dispute of industry and this is compared with the net opinion of the managers of the industrial organizations involved, the investigator will discover that there is no great difference in these opinions and reasonable measures of understanding on both sides would offer a basis for their solution.

The leaders of labor organizations usually consolidate the demands of the rank and file into a platform which becomes unreasonable because of its definite character and its assumption of rights. On the other hand, the manufacturers' group usually assumes a position, which would not be assumed by the individual manufacturers were they negotiating with their own employees.

In none of the strikes which I have investigated, not even in those cases where the demands seem to be utterly unreasonable and the parties at interest far apart, was there anything involved which a small group of men concerned with the same common purpose could not thrash out by taking the advantage of free and full discussion, provided, of course, that there was also some basis of confidence between the parties at interest.

It is well understood that individual employers and small groups of workers rarely view these industrial questions in such a light that they cannot negotiate them. It is also well understood that bodies of men who have bound themselves together for the extension and protection of their interest along a given line will always fight where the individual would compromise and will always carry their organization purpose further without regard to anything but the protection of the organization interest.

People who are interested in the management or control of industry are constantly assuring me that the peak of this trouble has been reached and that it will pass away.

People who are interested in the growth and development of labor organizations are assuring me with equal dogmatism that the worker is just beginning to come into his own and the developments of today are only the beginning of his articulation in this respect.

Both sides are right.

It is quite likely that the public irritation which has been growing very rapidly in the past months will make itself felt in the near future in such a degree as to discourage further immediate demands on the part of labor organizations. It is true that such a cessation would be temporary and would serve merely to rally the labor forces in the further consolidation of their ranks and the further strengthening of their own power.

We have emphasized from time to time the impossibility of securing any solution of the difficulty through the action of national collective bodies composed of laborers on the one hand and manufacturers on the other. We have emphasized the absurdity of expecting confidence to be established between such collective bodies unless there exists already a confidence between the individual manufacturer and his employees, which will solve the question for his unit. The smaller group must be developed into a unified organization before the large groups can come together. The only hope of the situation is the development of a better understanding, a better ground of confidence, and a better means of discussion in the individual organization itself and in very large organizations in the individual departments of such an organization.

The public discussion of the labor situation, the constant emphasis of the terms "labor" and "capital," "proletariat," etc., are creating class-consciousness in this country, where class differences are not supposed to exist. Every element which enters into the national consideration of this subject emphasizes and defines the differences between the groups and operates against agreement, no matter with what intention it may be written:

It is for the individual manufacturer to develop a unit in his own organization and confidence in his own ranks. If he does this, he will not be concerned with the general upheaval, and if this happened in a fair number of cases the unrest would begin to settle itself; not because labor has been defeated, nor because groups of manufacturers have become stronger, but because groups of individuals formed together for the purpose of production have arrived at a place where they can iron out their own grievances with a fair measure of justice.

A Department of Aeronautics

(*Continued from Page* 1001)

respective department, provided, however, that all general technical development, construction and experimentation shall be under the Department of Aeronautics.

SEC. 19. That the Director of Aeronautics shall annually, at the close of each fiscal year, make a report in writing to Congress, giving an account of all moneys received and disbursed by him and his department and describing the work done by the department. He shall also from time to time make such special investigations and reports as may be required by the President or Congress, or which he himself may deem necessary.

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IN the issue of AUTOMOTIVE INDUSTRIES for Oct. 23, an editorial was printed under the heading, "A Suggested Remedy for Crankcase Distribution." We hope that all interested readers recognized that the vital word in the heading was intended to read "Dilution." But, with a printing plant 1,000 miles away, certain errors are to be expected.

The Exchange Rate

THERE has been a marked change in the import situation as a result of the war and the economic readjustment. British manufacturers are not likely to make a very serious bid for American business, owing to their inability to satisfy the demand of their home market. Most of our imports in the next few years will probably come from Italy and France. Now, the currency of both of these countries is at present greatly depreciated, and this is a factor which will help the foreign manufacturer to make sales in this country. For every dollar the French manufacturer obtains in payment for his products he can now get nearly 10 francs in exchange, whereas in pre-war days he got only a little over five, and the Italian manufacturer even gets 12.5 lire for the dollar where formerly he got little more than five. This so-called unfavorable rate of exchange goes a long way in overcoming the handicap of higher production costs abroad as compared with pre-war days.

There is, however, another phase to the situation which works against the importer. This is that our Government in calculating the tax makes use of the nominal and not the actual rate of exchange. For instance, if a French car costs abroad say 15,000 francs, the duty would be based on a value of approximately $3,000 instead of $1,500, the actual present day equivalent of 15,000 francs. However, the loss on the duty is only a fraction of the gain on the exchange.

Ignition Experiments

UNDER the programs of research work carried out for advisory committees on aeronautics during the war, both in this country and abroad, a good deal of experimentation was done on ignition problems. We have already printed some articles on the work done at the Bureau of Standards in Washington, and we have recently received copies of reports issued by the British Advisory Committee, of which some also deal with the subject of ignition.

One of the interesting facts discovered in the course of the British research work is that the voltage required to break down the resistance of a spark gap is different when the gap is filled with pure air as when it is filled with a combustible mixture. Therefore, in order to obtain experimental results which are directly applicable to commercial problems it is necessary to make tests in an atmosphere of a combustible mixture. Mixtures of gasoline vapor and air are rather unstable and somewhat difficult to reproduce accurately, and it is, therefore, fortunate that mixtures of hydrogen and air show exactly the same behavior. Hydrogen and air are both permanent gases and can be accurately measured volumetrically when the mixture is prepared. That the effect of mixture on the spark voltage required is not of a minor degree may be seen from some plots published which show that with certain form of spark terminals it required a minimum of about 2,350 volts to produce a spark when the hydrogen formed 20 per cent of the whole mixture and 4,250 volts when it formed only 10 per cent of the mixture.

It has long been known that the spark voltage is directly proportional to the compression pressure, but we believe that very few ignition experts have been aware of the fact that it is also dependent upon the mixture proportion. Unfortunately, it is not possible to take practical advantage of this fact, because the proper richness of the mixture is determined by conditions of combustion, and sufficient voltage must be produced to cause a spark to pass irrespective of mixture conditions.

Another point brought out, or rather confirmed by the British experiments is that the shape of the discharge terminals has a strong influence on the spark voltage, pointed terminals, for instance, giving an effective spark with a much lower voltage than spherical terminals. Here, again, it is impossible to draw any practical advantage from the relation, for if needle point

spark terminals were used they would overheat and the spark gap would rapidly increase, requiring constant adjustment.

In the experiments referred to, the spark was produced by connecting a condenser across the spark gap and then charging it until a pressure was reached sufficient to break down the gap resistance. It was found that for higher spark voltages a lower capacity sufficed to insure ignition. There is, however, no definite relation between the spark voltage and the minimum capacity that will cause ignition; rather it appears that as the spark voltage gradually decreases, at certain points there is a distinct lowering in the minimum capacity required, and the voltage capacity characteristic appears to be of a stepped form.

Pneumatic Figures Needed

THERE is great need for authentic figures on pneumatic truck tire costs in different services. The claims made by different manufacturers vary widely. This is natural when it is considered that the figures are compiled from services operating under widely varying circumstances. The time has come, however, when definite conclusions should be drawn.

One manufacturer claims that on a ton-mile basis, the pneumatic will save 25 per cent on gasoline, 32 per cent on oil and 70 per cent on repairs. These figures were deduced from observations of trucks in service in Texas. It would be interesting to know how this checks with experiences in other parts of the country and some more or less concerted effort for getting down to hard facts on the pneumatic tire will be necessary before we have a clearly established idea of where they pay and where their serviceability is problematical.

It is very doubtful if the size of the truck has much to do with the matter, although there is doubtless a limit of truck size for which pneumatics are desirable. It is felt by many truck makers that the 1 to 1½-ton size should be practically universally equipped with pneumatics, and the 3½-ton size and over, rarely, if ever. It is the sizes in between, that in the middle ground, including trucks is, those from 1½ to 3½ tons capacity, which furnish the ground for debate. It is here that the purchaser must carefully weigh the conditions under which he will operate his trucks and make the decision. To help him reach his decision the manufacturer should equip his sales force with a mass of figures covering all phases of transportation, or the purchaser will be left very much at sea on a most important problem.

Furthermore, the matter is of the utmost importance to the truck manufacturer, because it will affect his design. If a large percentage of the trucks between 1½ and 3 tons capacity will require pneumatics, it is evident that new designs are required immediately, as tire manufacturers and others assert that there are few if any trucks in that capacity range really adapted to pneumatics.

The problem of design of a pneumatic-tired truck is altogether different from that of designing a vehicle for solids. Higher engine speeds and different gear reductions are necessary for these fleet freight carriers which are capable of 30 miles an hour and move across the relatively uninhabited sections of the country. It is with these vehicles that the ship-by-truck movement has been made a reality and considering the characteristics demanded of the truck the design reverts back very closely to passenger car practice in engine speeds and gear ratios.

A true picture of the situation will not be gained until we have complete statistics regarding costs in all the standard lines of transportation in which the trucks in the debatable class, between 1½ and 3½ tons, are used, and until recommendations made on the basis of observations of trucks in operation show what changes are desirable with the pneumatics. The invention of new rim types for the easy removal and replacement of the giant pneumatic, is a big step in rendering the large pneumatic truck more serviceable, but a collection of unbiased cost, speed and efficiency figures is needed to help the bewildered purchaser reach a positive conclusion before he selects his truck.

Vibrations of Buildings

FOUR years ago the Aberthaw Construction Company started an investigation on the vibration of buildings, particularly manufacturing buildings. The study was intended to cover not only the causes of vibration, but also the effects on the structure, on the machinery installed, on the health and well-being of the workers, and on the quantity and quality of production.

A preliminary report was published in the fall of 1916; but our entry into the war, and the many new problems which that brought, put a summary stop to the work. It is now being taken up again with the idea of following it through to a point where a complete report can be published. The Aberthaw Company will, therefore, be glad to have engineers, manufacturers and others having knowledge of the subject, or having had specific experiences which would throw light on any of its phases, communicate with the company at 27 School Street, Boston.

The previous work on this problem showed a wide diversity of opinion on some of its angles. It also developed that there is very little quantitative information extant which can be relied upon as giving authoritative data. It is particularly desired, therefore, that information of this character, however limited in its application, may be made available for the study.

IN an address delivered by Secretary Redfield before the recent American Manufacturers Export Association at New York, Secretary Redfield of the Department of Commerce said: "How shall we meet the situation arising from a world eager to buy but unable to pay? How shall we carry out the suggestion that we must ourselves both furnish the goods and the means of paying for them? * * * We must have means of credit adequate to the demands upon us. That means a credit-providing organization beyond anything we have ever known, too big for the banks, too big for the manufacturers, too big for the merchants and farmers, and only to be made big enough by combining the support in the form of an effective organization of all these forces."

Square Deal Policy Urged At Detroit Service Meeting

Modification of 90-day Warranty Clause and Replacement of Parts Suggested in the Full Discussion of Service Problems at Managers' Conference

DETROIT, Nov. 17—Better service relations between factory, distributer, dealer and the public are expected as the outcome of the interchange of ideas at the annual convention of the automobile service managers, who closed a three-day meeting here Wednesday and at which the square deal policy was the keynote. The factory's duty to the distributer, the dealer and the owner and the attitude to be expected of the latter, were dwelt upon at length in highly interesting and instructive papers that elicited much discussion during the business sessions of the convention.

The program, unlike the usual convention, was not burdened with long-winded essays, but marked by short concise papers dealing with the subject matter in hand, the greater part of the time being taken up with the discussion, during which much valuable information for the guidance of the service managers and the chamber was developed. A theater party Monday night and tours of the factory districts Wednesday, marked the entertainment features, luncheon being served by the local committee at the Statler hotel Monday and Tuesday and the visitors being guests at luncheon at the factories Wednesday.

General Manager Alfred Reeves of the National Automobile Chamber of Commerce, who came to Detroit last week to address the automobile sales managers, remained over for the service managers' meeting and assisted E. T. Herbig of the Service Motor Truck Co., who was chairman of the Standard Repair Parts and Service Policies Committee, conducted the business sessions of the convention.

The Warranty Clause

Recommendation of the committee on the revision of the service and repair parts policies, which propose a modification of the 90-day parts warranty clause, substituting a square deal policy with a plan for parts replacement in any reasonable period, dependent on the circumstances surrounding the individual case, was the feature of the meeting. In a statement to the service managers Reeves declared the subject was one of the most important in the industry and at his suggestion a resolution was adopted providing for having the report printed and circulated among the service managers for a referendum as to the substitution of the square deal policy for the 90-day warranty clause, by which the committee would be guided in its report to the chamber. In his report, Chairman Herbig said in part:

"In place of the technical obligation called the warranty, the committee felt a set of principles, as a working basis and a medium of understanding, could well be formulated, in which would be incorporated an expression of the manufacturers', distributers', dealers' and users' responsibilities, respectively.

"Satisfactory relationship between manufacturer and user is contingent upon mutual good faith. All manufacturers should guarantee to make good all their just obligations, expressed or implied, which would assure each and every user the maximum of service and at minimum cost.

Maintenance Results

"The best maintenance results can be obtained with the user through distributers and dealers representing the manufacturer. The distributers' and dealers' service obligations are, first, to carry out the manufacturers' square deal warranty with the user; second, to maintain adequate facilities for making repairs, adjustments and do general overhauling in a prompt and competent manner at reasonable charges; third, to thoroughly instruct the user in proper care and operation.

"The greatest responsibility for satisfactory service rests upon the user. The responsibility of the proper operation and care are entirely beyond the control of manufacturer and distributer. Upon the user carrying out consistently and intelligently the instructions on care and operation depends the success of the service."

With respect to detail practices and the manufacturers' responsibility for the replacement of defective parts, the report reads:

"Within 90 days after delivery of a new vehicle to the user, the manufacturer will furnish, free of charge at the factory or branch, duplicate parts to replace any parts that are returned to the factory or branch, with shipping charges prepaid, and which are determined by the company to have been defective in material or workmanship, or it will put such parts in condition good as new without charge."

As to repair parts, "discounts to independent repair shops will be subject to agreement between distributer or dealer and the repair shop; the manufacturer reserves the right to dispose, within 30 days, all parts returned, without assuming liability, unless covered by shipping instructions or adjustment is accepted; the manufacturer will refuse to consider claims for or accept for adjustment any parts not supplied by him."

Dealing with accessory service, the report continues: "For service and replacements on engine starters, batteries, magnetoes, generators, carbureters, tires, rims or other trade accessories that are not made by the manufacturer, application should be made direct to the nearest service station maintained by the maker of such accessory. While not assuming any direct responsibility for articles not made by them, the manufacturer, its branches or dealers, will do all possible to assure the user of a square deal from the maker of these parts or accessories. If, however, the accessory dealer is not adequately represented in a particular locality, the dealer therein is obligated to give the user proper service on such accessories. Manufacturers shall provide dealers with a list of manufacturers of accessories used on their product and a list of service stations."

Accessory Service

The report suggests that vehicles brought to service stations maintained by factory, branch or dealer, be inspected monthly without charge, the same service to be rendered at points outside of the service station at a regular charge based on the distance. Inspection includes examination and report by the inspector of his opinion of the condition of the vehicle. Necessary adjustments to insure standard operating condition to be made without charge during the first month after delivery, provided the vehicle has not been tampered with or injured by accident, abuse or neglect. Adjustments after the first month are to be made at regular service station charges. Every dealer is expected to give the same inspection and adjustment service on any truck made by the manufacturer without regard to the territory in which it was bought.

All work not included in inspection and necessary adjustment or installation of replacements will be charged for at regular rates under the committee report plan and an estimate of such charges shall be furnished the user, upon request, before the work is started and when it is done at a distance, for the convenience of the user, the time spent by the employes going to and from the job will be charged for at the regular rate, overtime being paid at the regular overtime rate when work is done at the request of the user.

The report suggests personal driving and maintenance instructions be furnished for a reasonable period after purchase without charge and the dealer must maintain a minimum stock of both current and service parts as specified by the manufacturer, the dealer furnishing an inventory of parts on request.

With regard to return of parts the report says: "Parts claimed to be defective must be returned to the factory with shipping charges prepaid within 10 days from date of replacement. The date when defect was discovered, manufacturers' number of the vehicle and owner's name and address must be given on a tag attached to part. Obsolete parts may be returned only by individual agreement with the manufacturer. Surplus parts also may be returned only by such agreement."

What the report states as the "most important part of the 'triangle of respon-

sibility' is that devolving upon the user, which it maintains he will shoulder by the proper dissemination of a plain statement of facts.

"The manufacturer and dealer are interested in the most efficient and economical operation of the vehicle but a full measure of co-operation is necessary on the part of the user, who should avail himself of all facilities provided by the service station. There is no reason why the user should not bear his rightful burden of responsibility, nor do we believe he will fail to do so if we show him the way," the report concludes.

More than half the morning Monday was spent in discussion of the committee report, following which E. A. Haskins, service manager of the Federal Motor Truck Co., read a paper on "Maintenance Relations Between Accessory, Parts and Assembly Manufacturers and the Vehicle Manufacturer, the Distributor, Dealer and Owner."

Haskins declared the parts manufacturer should keep the vehicle manufacturer informed as to contemplated changes before they were in production and depreciated the sale of parts to owners direct by the manufacturer. He declared it should be discouraged, but not prohibited, for the simple reason that the owner must have opportunity for keeping his car in operation no matter where his parts came from.

Following a lengthy discussion of Haskins' paper, in which many of the service managers participated, L. C. Voyles, service manager of the Nordyke & Marmon Co., read a paper on "Should the Factory Encourage Service by Independent Garages and Service Stations? If So, on What Basis?"

While, he said, it is necessary to provide means for a customer to get factory attention in remote places, Haskins took the position that it was manifestly unfair to encourage independent garages and service stations after a dealer had spent thousands of dollars in equipping his service station. He urged that it was the duty of the factory to correct complaints as to dealers' service through the dealer rather than to encourage independents and declared the surest cure-all for the independents was adequate and good dealer service.

Factory service organization occupied the attention of the service managers at the afternoon session Monday with three papers dealing with phases of the problem regarded as most vital to the industry. Albert Gough, service manager of the Liberty Motor Car Co., discussed the "Organization and Functions of a Factory Service Department for Maximum Service Efficiency," and was followed by R. C. Reichel, service manager of the Chalmers Motor Car Co., whose paper on "The Functions of Direct Factory Service Representatives in the Field" developed much instructive discussion on how the representative could best serve his two masters, the buyer and the seller, keeping in mind at all times the principle of the square deal.

The "Improvement of Vehicle Design

(*Continued on Page* 1039)

Postal Department Adds New Airplane Carrying 1000 Lbs.

Thomas-Morse Model Equipped with Two Liberty Engines Increases Air Delivery Fleet to Eight, Covering 1,906 *Miles Daily*

WASHINGTON, Nov. 18—The airplane mail service is now operating a plane that carries 1,000 pounds of first-class mail as compared with 200 pounds carried when the air mail service was first launched in May, 1918. The new plane is a Thomas-Morse equipped with two Liberty engines and has a capacity for 1,500 pounds of letters. The service is operating eight airplanes daily, covering 1,906 miles, and carrying 2,100 pounds of mail.

This service is not comparable, according to Second Assistant Postmaster General Otto Praeger, with foreign air mail service, as the British operations include 54 government airplanes transporting mail daily, carrying as much as 2,000 pounds in one plane. It is planning now to extend the service from New York to San Francisco, leaving New York, for example, on Monday morning and arriving at noon on Wednesday, making a saving of 48 hours.

Discussing the progress of air mail service in this country, Praeger pointed out that the Postoffice Department scored a performance of 96.4 per cent in its first fiscal year of operation and in addition has developed numerous aeronautic devices that have been found to improve the service. "At our suggestion," stated Praeger, "the Bureau of Standards developed a field marking radio device which will enable a pilot to steer exactly for the center of his landing field although it may be shut out by clouds, rain, snow or fog.

"Today we are operating daily eight airplanes between Washington and New York and Chicago, which advance more than 30,000,000 letters a year in carrier delivery from 16 to 24 hours. Within a week we will be flying the mail in the large twin-engine mail machines, built by the Glenn L. Martin Co. of Cleveland, between New York and Chicago, carrying 1,500 pounds, or 60,000 letters, on a trip in each direction. To gain an idea of the amount of mail that represents, let me say that counts made at various times show that all the letter mail accumulating in 24 hours in New York City for the city of Chicago is only 60,000.

"By December 15, when, through the enterprise of the citizens of Omaha, Neb., a hangar of 125 ft. span will be ready, the Postoffice Department will operate the largest land machines ever built in the United States. There are four immense planes having a wing span of 105 ft., equipped with three 400 h. p. Liberty engines and carrying one ton of letters without stop between New York and Chicago, or two tons of letters if a stop is made at Cleveland for gassing the machines. From Chicago the planes will continue to Omaha, 440 miles farther west, making a daily operation of 1,150 miles in each direction. These planes are now being pushed to completion by the L. W. F. Engineering Co. of College Point, New York. They will carry a pilot, an assistant pilot and a navigator, who is also the radio operator. In bad weather the planes will fly entirely by astronomical calculation, dead reckoning and radio direction compass.

"At the same time there are being completed for the Postoffice Department by the Thomas-Morse Corp. four planes of 1,500-pound mail capacity, designed especially for flying at high altitudes over the mountains. These planes, which are not much larger than our present DeHaviland mail planes, are the greatest load carriers in the world in relation to size. The two engines are in the center nacelle of the ship and the pilot sits in the side fuselage in one of the wings. The mechanic, who attends to the two engines, rides in the fuselage on the other side of the center nacelle, and has easy access to the engine compartments. The 1,500 pounds of mail is carried in the center nacelle.

"The Glenn L. Martin planes have a speed of 115 to 118 miles; the large three engine plane of the L. W. F. Engineering Co. will have a speed of 112 miles and the small 1,500-pound mail carrying Thomas-Morse planes will have a speed of 122 miles an hour.

"While these specially designed mail ships are being constructed, the Postoffice Department, in its endeavor to salvage and put to commercial use the surplus DeHaviland war planes, has rebuilt them entirely for strength and has created out of them a twin-engine plane which will fly at a speed of 85 miles an hour with two engines, and will carry 800 pounds of mail instead of 400 pounds now carried in the single engine DeHaviland.

"In closing, let me add that in the operation of the Air Mail Service for nearly one year and seven months, covering 405,563 miles of flying, we have lost but four pilots in crashes. Since January 1 of this year, the Army reports the death of 82 fliers; in addition to this there were a number of fatalities among naval and civilian fliers."

"The Postoffice Department has done all of this, besides equipping eight landing fields, with an expenditure of approximately $700,000. It should be a source of gratification to the entire postoffice personnel that the world has not known such flying or such economical administration of flying operations

Transport Conferences to Be Features of Truck Shows

Important Phases of the Industry Will Be Discussed By Nationally Recognized Experts at New York, Jan. 3-10 and Chicago, Jan. 24-31

NEW YORK.—The highway transport conferences, to be held in conjunction with the National motor truck shows in New York and Chicago, promise to be the most comprehensive yet held. The list of experts who have accepted invitations to speak covers every phase of the motor truck industry and promises a series of intensely interesting meetings.

The conference will open on the evening of Jan. 3 in New York, and on Jan. 24 in Chicago, with important inaugural sessions. Members of the President's cabinet, United States senators and governors of several states have been asked to participate in the inaugural programs.

Following the broader discussions of the general subjects of highways and motor transportation at the inaugural sessions will be the programs of specialization to be held during the afternoon sessions on the following six days. These sessions are primarily intended for those engaged in the motor truck industry, including manufacturing, distribution and service. In the evenings the programs will be primarily for motor truck owners, operators, and for shippers and any others interested in motor transportation. However, all sessions are open to the general public. On the closing day of each show there will be a joint session in the afternoon.

Features of all of the conference sessions will be the liberal use of illustrations, including stereopticon slides and motion picture films. For the "movies" a large number of films dealing with motor transportation in all its phases are being collected. Several are being secured abroad. Dr. Francis Holley, Director of the Bureau of Commercial Economics at Washington, is cooperating in the collecting of these films.

Among those prominent in the motor truck industry who are on the program are: F. W. A. Vesper, president of the N. A. D. A.; Robert O. Batten, truck sales manager of the Pierce-Arrow Motor Car Co.; J. W. Allen, Eastern branch manager of the Service Motor Truck Co.; David C. Fenner, of the International Motor Co.; Ray W. Sherman, editor of MOTOR WORLD; and a number of successful dealers from various parts of the country.

The various subjects having to do with the actual operation of motor trucks, especially from the standpoint of efficiency, will be discussed by: W. J. L. Banham, general traffic manager of the Otis Elevator Co.; Roderick Stephens, Stephens Fuel Co.; George H. Pride, president of the Heavy Haulage Co.; W. H. Kennedy, transportation engineer; Joseph Husson, editor of COMMERCIAL VEHICLE; Walter Ward rop, editor of POWER WAGON; George W. Veale, of Timken-Detroit Axle Co.; Ralph C. Rognon, President of Service Managers Association of New York; H. E. Merithew and H. W. Drew, transportation experts of Packard Motor Car Co.; T. M. Knight, of Armour & Co.; E. F. LaSchum, general superintendent of the American Railway Express Co., and Walter M. Ladd, service manager of the Pierce -Arrow Motor Car Co.

Among the men who will discuss farmers' haulage problems will be: Senator Capper, of Kansas; A. R. Kroh, Goodyear Tire & Rubber Co.; E. T. Meredith, publisher of SUCCESSFUL FARMING, and Raymond Olney, editor of POWEER FARMING.

Authorities on motor express operation include: Tom Snyder, secretary of the highway transport division, Indianapolis Chamber of Commerce; Professor Boyle, of Cornell University; J. D. Eggleston, chairman of the Highway Transport Committee of Iowa; F. W. Fenn, secretary of the Motor Truck Committee. National Automobile Chamber of Commerce; E. E. Peake, secretary of the Kansas City Motor Car Dealers Association; George D. Wilcox, of the Commerce Motor Truck Co., and E. A. Williams, Jr., of the Garford Motor Truck Co.

One of the most vital phases of motor transportation, that generally classed under the head of legislation, will be discussed by: Charles S. Bond, Counsel for the Motor Truck Association of America; Charles T. Terry, counsel for the American Automobile Association; Harry Meixell, Jr., secretary of the legislative committee, National Automobile Chamber of Commerce and F. H. Erstman, executive secretary of the Motor Truck Owners Association.

There is a general title for each session and two or three sub-divisions, each with its own subjects. For *New York* the subjects to be discussed are as follows:

AFTERNOONS.

Monday, January 5th.
- "Merchandising Motor Trucks."
- "The Trade Segregation Plan."
- "Effective Advertising."
- "The Farm Field."

Tuesday, January 6th.
- "Smoothing the Path of the Motor Truck."
- "Working for Highway Improvement."
- "Taking an Interest in Legislation."
- "The Automobile Legislative Council."

Wednesday, January 7th.
- "Selling On the Firing Line."
- "Proven Sales Plans."
- "Developing Prospects."
- "Promoting Rural Motor Express and Other Enterprise."

Thursday, January 8th.
- "In the Matter of Service."
- "The Truck Owner's Viewpoint."
- "The Truck Dealer's Plan."
- "The Manufacturer's Policy."

Friday, January 9th.
- "Selling Motor Transportation."
- "Handling Motor Trucks and Passenger Cars Together."
- "Offering a Complete Transportation Line."

EVENINGS.

Monday, January 5th.
- "Motor Vehicles in Passenger Transportation."
- "Replacing Street Cars with Motor Buses."
- "Motorbus Operation."

Tuesday, January 6th.
- "Increasing Motor Haulage Efficiency."
- "Cost Accounting, Routing and Dispatching."
- "Loading and Unloading Devices."
- "Incentive for Drivers and Helpers."

Wednesday, January 7th.
- "Rural Motor Express."
- "Its Opportunities as an Investment and Business Career."
- "Its Advantages to the Shipper."
- "Its Benefits to the Producer and Consumer."

Thursday, January 8th.
- "Aids to Motor Truck Efficiency."
- "Trailers."
- "Pneumatic Tires."

Friday, January 9th.
- "Motor Truck and Railroad Freighting."
- "Cost, Range and Service Comparisons."
- "Connecting Farms and Markets."

Saturday, January 10th.
- "Highways and Motor Transport."
- "Relation of Roads to Operating Cost."
- "Progress in Highway Improvement."
- "Constructing Roads for Motor Truck Traffic."

For *Chicago as follows*:

AFTERNOONS.

Monday, January 26th.
- "Merchandising Motor Trucks."
- "The Trade Segregation Plan."
- "Effective Advertising."
- "The Farm Field."

Tuesday, January 27th.
- "Selling Motor Transportation."
- "Handling Motor Trucks and Passenger Cars Together."
- "Offering a Complete Transportation Line."

Wednesday, January 28th.
- "Selling on the Firing Line."
- "Proven Sales Plans."
- "Developing Prospects."
- "Promoting Rural Motor Express and Other Enterprises."

Thursday, January 29th.
- "Promotion of Highways and Traffic." (This session under direction National Highway Traffic Association.)
- "Taking an Interest in Legislation."

Friday, January 30th.
- "In the Matter of Service."
- "The Truck Owner's Viewpoint."
- "The Truck Dealer's Plan."
- "The Manufacturer's Policy.

EVENINGS.

Monday, January 26th.
"Motor Truck and Railroad Freighting."
"Cost and Service Comparisons."
"Economic Range of the Motor Truck."

Tuesday, January 27th.
"The Farmers' Haulage Problems."
"The Horseless Farm."
"Connecting Farms and Markets."
"Farm Power."

Wednesday, January 28th.
"Rural Motor Express."
"Its Opportunities as an Investment and Business Career."
"Its Advantages to the Shipper."
"Its Benefits to the Producer and Consumer."

Thursday, January 29th.
"Highways and Motor Transport."
"Relation of Roads to Operating Cost."
"Progress in Highway Improvement."
"Constructing Roads for Motor Truck Traffic."

Friday, January 30th.
"Increasing Motor Haulage Efficiency."
"Cost Accounting, Routing and Dispatching."
"Loading and Unloading Devices."
"Incentives for Drivers and Helpers."

Saturday, January 31st.
"Aids to Motor Truck Efficiency."
"Trailers."
"Pneumatic Tires."

Goodrich Employees Subscribe $6,746,800

AKRON, Ohio, Nov. 18—The Goodrich Tire & Rubber Co.'s ten day stock sale to employees was highly successful. It was hoped to reach a $3,000,000 goal in two weeks, and instead $6,746,800 was subscribed for by 14,052 employees in ten days. The subscribers represent 61 per cent of the factory, and is a record for the 70 special stock salesmen who conducted the drive.

The campaign is considered specially successful in that it brings employer and employee into close relation for promotion of the industry.

The Service Managers' Meeting

(*Continued from Page* 1037)

and Quality Through Service Records" was entertainingly presented by Walter M. Ladd, service manager of the Pierce-Arrow Motor Car Co.

"What the Dealers Require from the Factory Service Department" was taken up by Ralph C. Rognon, president of the Automotive Service Association, New York, who pronounced the service station the bumper between the manufacturer and the owner. He declared the service manager must satisfy the customer, at all times keeping in mind the rules and policies of the manufacturer. The manufacturer, he said, expects the dealer to maintain a well-equipped service department and urged that the factory service department should co-operate with the dealer and give him all possible aid in attaining the ideal.

With the aid of several charts, upon which he pictured the method in vogue at the Packard plant, H. W. Drew, assistant manager of the technical service department of that organization, discussed plans for regulating the distribution of parts stock supply to insure adequate assortment and maximum activity. In regulating the amount of the dealer's investment in parts, he said it should be based on the number of cars in his territory, figuring the parts business at about $50 a car per annum. With the average turnover of 3½ divided into the $50 for each car per year, would mean $14.30 worth of parts to be carried in stock at all times for each vehicle in the territory.

W. M. Warner, manager of the parts department of the Cadillac Motor Car Co., in a paper dealing with "Pirate Parts" and the factory control of source of supply of spare parts and materials, declared the manufacturer should be on the alert to check the growth of this business. He pointed out that the reputation of the manufacturer often suffers wrongfully because of these parts not being up to the proper standards.

J. S. Bray, in discussing "The Extent to Which Free Service to Customers Constitutes Good Business," said beyond the replacement of parts that are of obviously faulty design or manufacture, the customer should pay for his service. He should not be allowed to purchase a car or truck with the understanding that it will be maintained for him. What he gets in the way of service he should pay for, said Bray.

O. T. Hillshafer, service manager of the Chandler Co., spoke on "Efficient Systems of Estimating Charges to Customers for Repairs." Hillshafer did not go into detail on any particular system, but brought out the thought that a previous estimate, correctly made, prevents the customer from being discontented with the bill after it arrives. The basis upon which he suggested that estimates be made is upon time studies in previous jobs of similar character.

A. B. Cumner, of the Autocar Co., dealt with "The Necessity for Inaugurating an Educational Program Emphasizing the Responsibility of Vehicle Users." The dominant thought brought out by Cumner was that the car or truck owner has a duty to perform and it is up to the manufacturer to see that he realizes that he must take care of the vehicle in the way it should be maintained. This idea struck a responsive chord with the service managers and Cumner's paper was greeted with vigorous applause.

The visits to the factories Wednesday were made in four groups, each group being shown through two automobile plants in the morning and two in the afternoon, giving each service manager opportunity to see cars and trucks built and assembled in four different factories. Arrangements also were made for showing the visitors through other plants on Thursday and many of them took advantage of the opportunity to remain over and have a look through all of the factories.

A resolution providing for the formation of an Association of Service Managers affiliated with the N. A. C. C., was adopted, and Indianapolis was selected as the meeting place next year.

ACCESSORY BODY APPOINTS SECRETARY

A. W. Barber to Represent Motor and Accessory Organization in Field

NEW YORK, Nov. 19—Because of the rapidly expanding work of the Motor and Accessory Manufacturers' Association, it has been found necessary to appoint a field secretary to travel about the country and keep in direct personal touch with the various members.

M. L. Heminway, general manager of the association, announced today that Alexander W. Barber, formerly connected with the credit department of the Irving National Bank of New York, has been selected for this work. Barber has started on his first Western trip.

By training and experience Barber is well equipped for his new work with the Motor and Accessory Manufacturers' Association. With the Irving Bank he handled many important accounts in the automotive industry. Prior to that he was a member of the inspection department of the New York Life Insurance Co.

Barber will not only keep in touch with the credit managers of companies in the association, but with other executives as well. By contact the association will obtain greater co-operation from its members and receive the benefit of constructive suggestions.

The membership of the Motor and Accessory Manufacturers' Association has been increasing largely in the last few months. The full roster includes more than 360 companies, manufacturing motors, parts, tires and equipment for the automotive industry, or an increase of more than 25 members since July last.

Wisconsin to Feature Trucks at State Fairs

MILWAUKEE, WIS., Nov. 17—The construction of a great exposition hall at State Fair Park, Milwaukee, to accommodate exhibits of motor trucks, trailers, tractors, farm lighting plants and kindred machinery, leaving the present Motor Hall exclusively for passenger car and automotive equipment displays, is proposed by the state fair division of the Wisconsin Department of Agriculture as a further development of its exposition extension plan. It is only four years since the automotive industries have been recognized to the extent of making provision for a permanent show hall. This was outgrown almost from the start, but the war prevented enlargement. The fair board has now asked the Milwaukee Automobile Dealers, Inc., to present suggestions for financing the construction and equipment of a second large building. Frank J. Edwards, Dodge distributer, has been appointed chairman; R. C. Chidester, Packard, and Alfred Reeke, Nash, members of a special committee of the dealers' association to represent it in these negotiations. It is hoped to get the proposed new building ready by the time of the 1920 fair during the second week of September.

AIRPLANES PROVE VALUE FOR PATROL

Hunting Season Losses Held to a Minimum—Propose Use of Wireless Phone

WASHINGTON, Nov. 18—At the conclusion of the first season in which aviators have maintained an organized fire patrol in the United States, the officials of the Forest Service, United States Department of Agriculture, state that the record made by the airplane has proved beyond question its effectiveness as an aid in locating forest fires.

This new flying undertaking was performed by the Air Service of the War Department, with its personnel and equipment, and at the expense of that organization. For three months uninterrupted service was maintained, and a total of 745 flights covering 92,605 miles were made. Many fires were discovered located and reported in advance of the regular Forest Service detention organization.

Six patrol routes covering national forest areas of high value in California were followed, and twice each day six Curtiss airplanes covered the better part of 9,000,000 acres of rough mountainous, heavily timbered country. The average non-stop run was 160 miles, the average round trip, 320 miles.

With the opening of the hunting season in the middle of the second month of daily flying above the forests, the fire situation in northern California became critical and an extension of the air patrol was asked. This was one of the principal factors necessitating a complete re-organization of the whole air patrol in California. De Haviland planes were substituted for the slower planes of smaller gasoline capacity and less climbing power. Two news bases were established. New daily routes were laid out, one of which covered 560 miles, and the service was extended from the original five to fifteen national forests in California.

Patrol Was Efficient

Beginning September 1, eight airplanes covered twice each day the the area under surveilance. Eight additional airplanes were used on alternate days to allow for necessary repairs and relief of pilots. Sixteen pilots and twenty-two mechanics were assigned to the work. Up to the first of October only six forced landings, with one fatality and no injuries to pilots or observers, occurred. Damage to the airplanes, considering the number of miles covered and the rough country patrolled, was negligible. No figures as to the cost of the experiment have been made available.

In the discovery of fires the air patrol showed itself 85 per cent efficient and it is declared that it can be made practically 100 per cent efficient either for providing for a longer period in the air or possibly by making the time of flight correspond more closely to the hours of the day when the largest percentage of fires start.

Experience shows that while the effective "discovery radius" varies with atmospheric conditions and the height of the observer, an observer at an altitude of 5,000 ft. can detect a fire at least 30 miles distant.

Though experience and familiarity with the country are important factors in accurately determining the exact location of fires, wonderful results were obtained by pilots entirely new to the region but equipped with such maps as were available. One lieutenant flying a DeHaviland over an entirely new route placed within one-half mile of its actual location of 200 acre fire that was 35 miles away. To see it he had to look almost directly into the sun.

On a whole, the reporting of fires, as distinguished from discovering and locating them, was not so satisfactory.

Parachutes with messages attached, which were occasionally used, proved to be uncertain. Carrier pigeons released in the air and reports made by telephone and telegraph after landing were found to be too slow to insure best results.

Publication of this issue of Automotive Industries has been delayed until Dec. 13 by conditions over which the publishers have had no control. Further issues will be forthcoming as rapidly as they can be printed.

It is believed that the wireless, preferably the wireless telephone, offers the solution of this difficulty in the air service fire patrol.

Without wireless or some other method of hastening the reports, the airplanes can never function as efficiently as the present lookout system, say the Forest Service officials. In the matter of procuring reports of the progress of fires already known to be in progress, it has been found entirely practicable to get quicker, more complete and more satisfactory reports by means of the airplane than by any other method so far tried. This applies either to small, widely scattered fires or to large conflagrations.

It seems possible that the use of airplanes has been beneficial also in lessening the number of fires. One valley in southern California until this year has been the scene of repeated devastating fires, due no doubt to carelessness. With airships flying overhead twice daily, the valley has been without fires. The moral effect of the air patrol is credited with the change.

As a result of this season's record a request has been made for continuous daily airplane patrol of all the national forests in California.

CADILLAC RECORD MONTH

DETROIT, Nov. 14.—The Cadillac Motor Car Co., recorded the largest production in its history during the month of October, when approximately 3,500 cars were sent out of the factory. Plans for greater daily production during 1920 are being formulated, though the volume of production apparently even then will not meet the demand, in the opinion of Lynn McNaughton, general sales manager.

FRANKLIN TO ENTER MOTOR TRUCK FIELD

Syracuse Passenger Car Maker Announces One-Ton Job —Production in a Year

SYRACUSE, N. Y., Nov. 18—H. H. Franklin, president of the Franklin Manufacturing Co., announced today that the company will engage in the making of 1-ton Franklin trucks in about a year, in a plant separate from the present passenger car factories here.

The company will specialize in the 1-ton truck because its officers believe the widest field is offered this type of vehicle. They have in mind the use of trucks by farmers and the Franklin, with its air-cooled motor and its adaptability to country highways, is expected to supply a big demand.

Many details remain to be completed. Ligh weight and extremely economical operating costs are among the features claimed for the first truck to be placed on the market by these passenger car makers.

It is announced that John Wilkinson, vice-president of the company and inventor of many improvements on the Franklin passenger cars, will give a lot of attention to the development of the new truck.

Ralph Murphy, chief engineer of the company, has appointed James L. Yarian to be chief engineer in charge of development and manufacture of the trucks, and Yarian is making preparations now for drafting and experimental work.

British Rover Co. to Reintroduce Light Car

LONDON, Oct. 24—The Rover Co., Coventry, are going to reintroduce a light two-seater car of 8 h.p. to sell at $1,150 with dynamo. The engine will have two aircooled cylinders and the power layout will be a disc clutch, 3 speeds and reverse gear, and wormaxle. The weight will be about 900 lb. Quantity production is talked of, but as a similar report is current about the same makers' standard "12" car, it is not clear where room will be found for two such outputs. The introduction of this small car recalls that the Rover's first car was a single cylinder 8 h.p. two seater, and was followed by a 6 h.p. Later this company used Knight sleeve-valve engines for a time, but reverted to the poppet valves form. The biggest success was in 1911-12, with the first Craig-designed "12," Craig subsequently joining Darracq's, with whom he continues.

OPENS WOOD PARTS PLANT

FREMONT, O., Nov. 15.—The Auto Wood Stock & Ladder Co., manufacturers of wood spokes, rims and parts of car bodies, has opened a plant in this city employing 20 skilled mechanics.

FIAT TAKES FIRST IN BELGIAN TRACTOR TEST

Leads American Makes in Economy and is First in Hauling

PARIS, Oct. 6.—(Special Correspondence)—Belgium's agricultural tractor trials were only partly competitive. An area of 2.47 acres had to be plowed in not more than four hours, all machines had to be subjected to a drawbar test, and gasoline or kerosene consumption was carefully noted.

On the fuel consumption test the Fiat tractor, which was the only Italian competitor present, came out the winner with 6.57 American gallons, the fuel used being commercial kerosene. The others in order of merit in the fuel tests were Case, 7.1 gall; Austin, 7.7 gall.; Moline, 8.09 gall.; Whiting Bull, 9.3 gall.; Fordson, 9.4 gall.; Wallis, 9.5 gall.; Cleveland, 9.9 gall.; Titan, 10.3 gall.; Advance, 12.3 gall.; National, 12.4 gall.

The drawbar test consisted of hauling a trailer loaded with 4½ tons of beetroots up an 8 per cent gradient. The Fiat tractor made the fastest time in this, and the others which succeeded in accomplishing the whole of the climb were Cleveland, Moline, Saunderson and Titan.

A technical committee was awarded the task of giving points for mechanical construction and regularity of operation. The highest number of points under this head went to the Fiat with 94. The lowest number awarded to any machine was 63.

Uruguay Markets Wide Open for American Cars

BOSTON, Nov. 18—Mateo A. Frugoni, who came to the United States recently from Uruguay to study automobile and truck construction and compare the products with those offered by European makers, sees a wide field there for American goods.

"Among the South American countries Uruguay ranks first," he says, "as a market for American cars and trucks. The automobile has a prominent place among its 1,500,000 people, and already one person in every 268 is an owner. The development of good roads, parks, etc., has greatly enhanced the popularity of automobiles in the past few years.

"While European makers have long realized the importance of Uruguay as a field of export, the American makers have been slow to develop this field. The Europeans have sent special missions to the country, with mechanics, car and aeroplanes to demonstrate the good qualities of their machines.

"Very soon we will have air service with Buenos Aires and Rio de Janeiro, which means that these cities will become broader markets for the future, in direct communication with Montevidio, our capital, which is visited by ships from all parts of the world.

"The Automobile Club of Uruguay, in spite of the fact that it is a new institution, has thousands of members, and is working hard to extend the automobile industry there."

TEMPLAR PRICES RISE

CLEVELAND, Nov. 18.—The Templar Motor Corp. of Cleveland, has announced an increase in the price of Templar cars on and after Dec. 15. The new prices follow: Touring, $2.685; Sportette, $2,685; Roadster, $2,685; Sedan, $3,585; Coupe, $3,585. The former prices for touring models and sedans were $2,485 and $3,385 respectively.

ABANDON EBERTS FIELD

WASHINGTON, Nov. 17—Eberts Field near Little Rock, Arkansas, will be abandoned by the Air Service, according to recommendations just issued by the Secretary of War.

Goodyear Nearing $200,000,000 Sales

NEW YORK, Nov. 17—With sales of $167,315,000 for the year ending Oct. 31, 1919, the Goodyear Tire & Rubber Co. is expected to enter the $200,000,000 group of industries during its present fiscal year.

A new high sales mark for October was set with $20,000,000. In October a year ago sales were less than $10,000,000 and in November, 1918, less than $7,000,000.

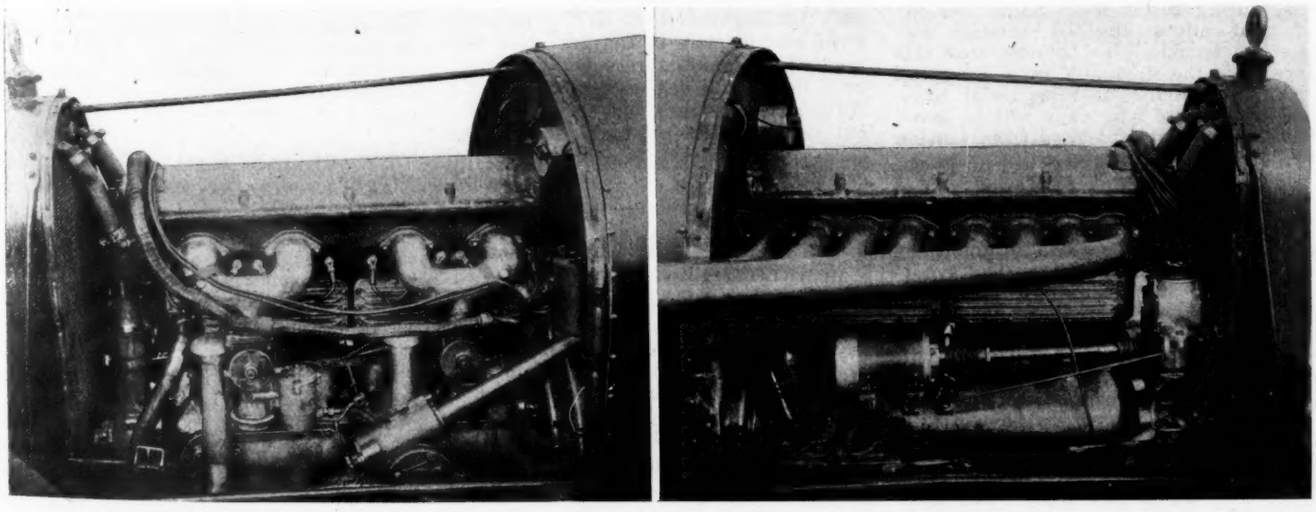
The remarkable expansion of this company is shown in the following table of sales by months for the fiscal years ending in 1919, 1916, 1911 and 1908:

	1907-08	1910-11
November	$82,127	$497,099
December	72,483	464,479
January	84,367	557,197
February	119,541	834,519
March	189,875	1,161,071
April	245,729	1,340,203
May	254,831	1,398,869
June	267,689	1,363,146
July	259,173	1,316,076
August	236,837	1,397,194
September	175,795	1,505,542
October	201,296	1,426,866
Total	$2,189,749	$13,262,265

	1915-16	1918-19
November	$3,079,955	$6,902,962
December	3,335,441	7,498,278
January	4,609,646	8,919,583
February	3,792,306	11,622,809
March	4,919,837	13,782,847
April	6,519,672	16,704,271
May	5,234,955	15,504,261
June	6,279,644	15,351,592
July	6,137,060	15,952,278
August	6,754,627	17,888,065
September	6,811,817	17,188,907
October	6,475,394	*20,000,000
Total	$63,950,399_	*$167,315,857

*Estimated—Based on 11 months' operation.

The New Duesenberg Racing Engine



Duesenberg eight-cylinder engine which broke many records at Sheepshead Bay Nov. 10

BRITISH AVIATION ACTIVITIES CONTINUE

Air Transport Facilities Increasing and Plans for World Routes Made

WASHINGTON, Nov. 18—British aviation activities continue, according to reports received by the Department of Commerce. The British Air Ministry has located vertical searchlights at airdomes to project beams from dusk until all service machines have arrived at their respective hangars. The beams are varying in number to indicate the particular airdome. For example, Hounslow will project one beam, while Kenley will send up two.

Air transport facilities are for the present confined to the London-Paris and London-Brussels services of the Airco and Handley-Page companies, the aircraft of the Messageries Ariennes which fly in conjunction with the Handley-Page service and the new route opened recently by the British Aerial Transport Co. between London and Amsterdam. This is a weekly service, but another daily London-Amsterdam service is in contemplation for the very near future.

The Handley-Page Transport Co. has introduced, in connection with its air services, the novel feature of a luncheon basket, consisting of a small carton containing six sandwiches, fruit and chocolate at a cost of 72 cents, while wicker holders for bottles and glasses are affixed to the walls of the stateroom. Up to October 4, fifteen London-Paris flights had been accomplished by this company each way, with a total of 219 passengers and approximately 6000 lbs. of freight, and nine London-Brussels flights each way. with an average of six passengers per flight.

The Airco express planes which fly daily between London and Paris, have completed the sixth week of continuous operation, having completed eighty-three out of a total schedule of eighty-six flights without stoppage or breakdown. As a proof that the airplane is no longer unreliable in bad weather, a representative of the Airco Co. stated that once only during 20,750 miles flying has one of their pilots alighted through mechanical trouble. He believes that this service is the first link in a European chain of 100-miles-an-hour aerial ways, and that before long days will be saved in the transport of letters from London to the great continental cities.

Moor Ships to Tower

The Great Northern Aerial Syndicate is in negotiation with the Southport Corporation with regard to an ambitious scheme of aircraft service. The syndicate desires to acquire ground near Southport, where it proposes to erect a tower 120 to 150 ft. high to which airships may be moored. An elevator will take the passengers up the tower and into the gondolas of the ships.

The company intends to have a fleet of nonrigid airships in commission next Spring. The smaller will carry thirty-two passengers and crew and the larger forty passengers and crew. The company also anticipates running some of the larger rigid airships now in course of construction. These will have a carrying capacity of 150 passengers and be able to travel to any part of the globe. It is proposed to use the smaller nonrigid airships to feed the larger ones and meet them at the principal centers. The smaller airships are to cruise between Blackpool, Southport and the Isle of Man. The larger airships are to be fitted in luxurious style with carpeted floors and folding arm-chairs. A balcony will run along the outside of the car. The cost per mile is put at about half the cost of a taxicab fare today, approximately about 18 cents a mile.

The scheme provides for the inclusion of Southport in the link of an aerial service commencing at Liverpool, traveling by Southport, Lytham, Blackpool, Fleetwood, Barrow, Whitehaven, Ramsey, Belfast, Dublin, and Holyhead, back to Liverpool. So far four routes have been outlined for the larger ships—(a Liverpool to York, Hull, Copenhagen, Stockholm, Petrograd, Tomsk, Pekin, San Francisco, New York, Queenstown, and Dublin; (b) Liverpool to London, Paris, Barrow, Colombo, Perth, Melbourne, or Sydney; (c) Liverpool to Cardill, Lisbon, Sierra Leone, Cape Town, Buenos Aires; (d) Liverpool to India, Belgium, Germany, Austria, Turkey and Persia.

Fords Meet Demand British Can't Fill

NEW YORK, Nov. 15—Resentment among British automobile manufacturers against activities of the Ford Motor Co. in Great Britain, as reported by certain British trade papers, does not exist, according to W. C. Anderson, director of the Ford interests on the British Isles. British carmakers he had met—and they were many—showed utmost cordiality, Anderson said, and many had taken advantage of a standing invitation to visit the Ford plant and observe the company's manufacturing methods. In addition, the director said, a considerable study of the situation in Great Britain had failed to reveal any trace of reported resentment.

There is room in the British Isles for the Ford without harm to the interests of British factories, Anderson declared before going aboard ship today on his way back to England from a conference at Ford headquarters in Detroit. Not only are British manufacturers unable to meet, even in a small degree, the demand for British type of cars, but they are without organization or facilities to take care of the market to which the Ford caters, he said.

FIRM TITLES CHANGE

CHARLOTTE, N. C., Nov. 17—Announcement is made in the trade that the name of Foremann-Howard Motor Co. has been changed to Foreman-King Motor Co. and the Foreman-Howard Motor Co., of Columbia, S. C., has been changed to Foreman-Lewis Motor Co.

In August L. J. Howard's stock was bought by W. R. Foreman, G. C. King and S. P. Lewis, and the change of name is now taking place. Howard will remain as salesman for the Foreman-King Co.

AUTOMOTIVE SOCIETY NOMINATES OFFICERS

Engineers Will Ballot by Mail and Announce Results Jan. 6-8

NEW YORK, Nov 18—The annual nominating committee of the Society of Automotive Engineers has submitted the names of the consenting nominees for the elective offices of the society, which become vacant at the close of the administrative year. The nominations are:

President—J. G. Vincent (to serve one year);

First Vice-President—J. G. Utz (to serve one year);

Second Vice-President—W. G. Wall, representing motor car engineering (to serve one year);

Second Vice-President—G. L. Martin, representing aviation engineering (to serve one year);

Second Vice-President—H. C. Buffington, representing tractor engineering (to serve one year);

Second Vice-President—C. A. Criqui, representing marine engineering (to serve one year).

Second Vice-President—L. M. Ward, representing stationary internal-combustion engineering (to serve one year);

Members of the Council—F. M. Germane, N. B. Pope and A. W. Scarratt (to serve two years);

Treasurer—Charles B. Whittelsey (to serve one year).

The nominating committee was composed of three members at large elected at the business session of the semi-annual meeting held in June, and eight members elected by sections of the Society as follows:

F. E. Moskovics (Chairman), Indiana Section; B. B. Bachman, Pennsylvania Section; J. T. R. Bell, Buffalo Section; J. L. Mowry, Minneapolis Section; M. A. Smith, Mid-West Section; J. E. Schipper, Detroit Section; J. V. Whitbeck, Cleveland Section; W. H. Conant, G. P. Dorris and C. C. Hinkley, members at large; and C. F. Scott (Secretary), Metropolitan Section.

Ballots bearing the names of candidates will be mailed to each voting member prior to the 1920 annual meeting to be held in New York, Jan. 6-8. At the first session of this meeting tellers will canvass the ballots and certify the result of the election.

RELIANCE CO. BUILDS

APPLETON, WIS., Nov. 17.—The Reliance Motor Truck Co., Appleton, Wis., will begin work early next spring on a four-story factory addition, 70x300 ft., which will cost about $230,000 with full equipment of new tools and other machinery for manufacturing motor trucks and rear axles. J. F. Balliet is president and general manager.

GILL PISTON CHANGES

CHICAGO, Nov. 17.—The New York distributorship for Gill Piston Rings, with offices at 1864 Broadway, has been reorganized under the name of The Gill Piston Ring Corp., instead of The Schade-Phelps Corp. as in the past.

BIG INCREASE SHOWN IN TRUCK SHIPMENTS

Success of Freight Carrying Concerns Creates Demand for More Vehicles

DETROIT, Nov. 17.—"Ship-by-truck" concerns that a few months ago were operating one or two used trucks, encouraged by the enthusiastic response of shippers, are branching out in all departments. Many concerns are employing regular traffic managers, are operating return-load bureaus and have established fuel and repair stations along the routes they are covering.

With a desire to in every way encourage the movement the manufacturers are compiling information on which to base freight rates and a comprehensive plan of truck line systems appears destined to be the outcome. New companies are being started in many sections of Michigan and Ohio and those in operation report capacity business.

The Rainbow System of Motor Transportation will begin operations between Detroit, Cleveland, Toledo, Youngstown, Ohio, and Pontiac, Mich., December 1, with an equipment of 22 trucks and 26 trailers. The corporation was organized in Cleveland and is headed by Richard Ferguson. Each train, consisting of a truck and one or two trailers, will carry from 12 to 15 tons, maintaining an average speed of 12 miles an hour.

A company organized in Cadillac, Mich., the home of several truck factories, now has four trucks in operation over the route of the defunct Michigan East and West Railway, formerly operating between Manistee and Marion. So successful has been the venture the company has placed orders for additional trucks and trailers and will broaden the scope of the business to include all roads in that section of the state. The railway, built to haul lumber, was abandoned when the timber supply was exhausted and since then farmers who have developed the lands have had no way to get their products to town other than by wagons.

A new company also is being formed in Ionia, Mich., to cover the territory in that section with a motor truck express line.

Louisville to Have $250,000 Tire Plant

LOUISVILLE, Ky., Nov. 17—Louisville is to have a tire and tube manufacturing plant which will cost $250,000 and which will employ 300 men, according to a statement by W. R. White, Cleveland, who has been in Louisville for two weeks looking over the situation.

Mr. White says the corporation which contemplates building here will be known as the Kentucky Tire & Rubber Association; that articles of incorporation have been filed under the laws of Delaware, with a capital stock of $1,000,000, and that stock consists of 5,000 shares of 8 per cent accumulative preferred stock and 50,000 shares of common. Preferred stock will be issued at $100 a share and common at $10.

Paris, Oct. 15—This picture shows a motor-cycle street sweeper recently exhibited here. Its inventor and rider is Jacquelin, one-time champion cyclist.

The proposed building will be 60x300 ft. and will be modern in every respect. Part of it will be two stories high and there will be additional boiler room space. Construction will be of the metal sash type and the unit system will be employed to take care of expansion. There will be a clubroom, restaurant and parking space for employes.

Goodrich Two Units to Cost $106,000

AKRON, Ohio, Nov. 18—Two permits have been granted the B. F. Goodrich Co., one for a $90,000 addition to be used for manufacturing and warehouse purposes, the other for a $16,000 refrigerator. The first addition will be one story high, 272 ft. long and 240 ft. wide. The refrigerating plant will be 60x45 ft. and three stories in height. Both buildings will be fireproof. Work is to be started at once.

CHINESE BUY TRUCKS

WASHINGTON, Nov. 12.—Fifty American motor trucks will be purchased by a development company located at Lungkow, Shantung Province, China, to haul the vast quantities of export produce and products to Lungkow for shipment abroad, according to report made to the Bureau of Foreign and Domestic Commerce. This plan was evolved because of the hopelessness of railway communication with Weihsien, due to present political and economic conditions. The Peking authorities will co-operate in road repairing and construction from Lungkow to Weihsien. The introduction of a motor truck transportation system will revolutionize the export trade of north central Shantung Province and will make Lungkow a serious competitor with Chefoo for the import and export trade of this region.

ROTARY STOCK INCREASED

ZANESVILLE, O., Nov. 17.—The auber Co., has been increased from $400,-thorized capital of the Rotary Tire & Rub-000 to $800,000. The concern has just about completed the erection of a modern tire and tube factory.

ITALY PROPOSES ROAD RACES AND AIR MEETS

Schneider Cup Aviator Trophy Prizes for High and Low Speeds

PARIS, Nov. 6.—(Special Correspondence)—Italy proposes to hold a road race next fall for machines having a maximum cylindrical capacity of 183 cubic inches. It is believed the course will be over a set of fast roads in the neighborhood of Brescia.

Immediately after the automobile race in Italy will stage an important aviation meeting, which will include the race for the Schneider Cup, to be competed for by flying boats. The aviation meeting will be on a more scientific basis than any held in the past. There will be a test for the highest and the lowest speed, awards being given according to the greatest difference between the two speeds. There will be a 600 mile competition with a minimum useful load to be carried. Another competition, over a distance of 700 miles, will be for planes with two or three engines. Points will be given for speed, climbing ability, load carrying, and ability to fly with one or more engines cut out.

New Interests Pay Premier Indebtedness

INDIANAPOLIS, Nov. 18—All of the outstanding indebtedness incurred by the former management of the Premier Motor Corp. has been liquidated one hundred cents on the dollar by L. S. Skelton, the new president, who recently bought controlling interest, according to an announcement made here late last week.

The officers of the new company include: Frederick P. Nehrbas, vice-president and general manager; Charles S. Crawford, vice-president in charge of engineering, and E. W. Hurd, director of sales and advertising.

$87,000,000 ROAD PROGRAM FOR OHIO

Special Appropriation Levies Carried in Sixty of Eighty Counties

CLEVELAND, Nov. 18—Ohio, thanks to the efforts of the state's automobile clubs and public spirited citizens, will have the most pretentious road building program in 1920 in its history.

Returns from the recent election which have been received and tabulated by executives of The Cleveland Automobile Club, show that special tax levies for good road building aggregating approximately $7,000,000 were approved by the electors. These levies will be made in addition to the regular road building program of the state, and are outside of the help the state will get from the Federal Government.

The sentiment for good roads was never so strong in Ohio as at the present time. Election returns show that this sentiment is not limited to any particular section of the state; but that the entire commonwealth is ablaze with good roads fervor. Sixty of the eighty Ohio counties approved special levies, while in only six, where the roads are practically all improved, were the proposed levies rejected.

Back of this development is seen one of the reasons for the rapid advance of Ohio as an automobile owning commonwealth. A few years ago it occupied a modest position in the rank of states with respect to the number of automobiles owned within its limits. According to recent records Ohio stands at the head of the rank in this respect. Now that so many machines are owned the possessors are determined that they shall have highways to ride upon in comfort, and predictions are made that good roads programs have not reached the crest.

The levies submitted this year were under the provisions of the Busbey-Fouts highway bill, which was passed last spring by the General Assembly in response to the demand of The State Automobile Association. The levies will be used to maintain county or unimproved roads.

Bill Provides for Big Plane Purchase

WASHINGTON, Nov. 17—The purchase of 490 airplanes and 600 engines, to cost $13,402,625, by the War Department, is forecast by the introduction of a bill in Congress which will appropriate this sum of money as follows:

200 Martin bombing planes for	$5,000,000
50 units of spare parts for Martin bombing planes	625,000
50 U. S. XB1-A observation planes	725,000
12½ units of spare parts for observation planes	90,625
100 Ordnance Engineering pursuit planes	1,100,000
25 units of spare parts for pursuit planes	137,500
140 B E-7 training planes	1,260,000
70 units of spare parts for training planes	315,000
600 Hispano-Suiza 300 h. p. engines	4,200,000
300 units of spare parts for Hispano-Suiza engines	1,050,000

The sums appropriated and specified are the maximum amounts allowed for payment. In case of the Martin bombers, not more than $25,000 is to be paid for each machine, and the machine is to be made and assembled in accordance with specifications from the air service.

The bill carries the provision that none of the money appropriated shall be used for the purchase of any airplanes or parts not wholly manufactured within the United States.

Starts 4,000-Mile Trip in Single-Seat "David"

PARIS, Nov. 6—(Special Correspondence.)—On a little single-seater touring airplane built by Farman Bros., the aviator Boussotrot has set out on an aerial touring expedition of 4,000 miles. Starting from Paris, the French aviator will make for Bordeaux, Biarritz, St. Sebastian, Vittoria, Madrid, Seville, Gibraltar, Tangiers, Rabat and Casablanca. After excursions in Morocco, the pilot will return to Paris via Gibraltar, Barcelona, Madrid, Perpignan, Toulouse, Marseilles, Avignon, Lyons and Dijon.

The object of this journey is to prove that touring by airplane is a practical and economical proposition. Boussotrot has set out alone without making any special arrangements in advance for supplies or landing grounds, and at the end of his journey he will publish a detailed account of all his expenses.

The machine in which this flight is being made is known as the "David," and is one of the smallest, safest and handiest single seaters ever built. Its span is 21.9 ft., length 18.2 ft., total area 215 sq. ft., chord 4.8 ft.; its maximum speed is 80 to 87 miles and its landing speed 37 miles an hour. The plane is driven by a 40 h. p. Le Rhone engine. This plane has been designed for use by the ordinary aviator, with the idea of making it the runabout of the air. It is claimed that one man can operate it and maintain it, and that its gasoline costs are at the rate of about 3 cents a mile.

WILL MAKE EQUIPMENT

CUYAHOGA FALLS, O., Nov. 17—The Auto Alarm and Manufacturing Co., has been chartered with a capital of $10,000 to manufacture automotive equipment. The incorporators are George D. Porter, William H. Taylor, E. F. Cushman, C. H. Howland and Charles Bertsch.

COFFEE CROP FAILURE CURBS BRAZIL TRADE

Depreciated Incomes Force Owners to Sell or Hire Out Speed Cars

NEW ORLEANS, La., Nov. 18.—Brazil is a good country for auto salesmen and exporters to stay away from until the next coffee crop comes in, according to Edward S. Buchanan, a machinery importer of Rio de Janeiro, who is in New Orleans on business.

"The coffee crop failure in Brazil has turned hundreds of high grade, privately owned automobiles into the street, where they are barely making their gasoline by running for public hire," said Mr. Buchanan. "These cars were originally purchased for private use in times of prosperity, particularly following the large coffee crop of 1918, but when the crop failed this year, their owners were compelled to sell them or put them to work. The result is that many of these high grade cars are for sale at half, or less, of their real value, and, with all these on the market, there is little opportunity for the salesman of new cars.

"Widespread use of automobiles for business, pleasure and social purposes is a striking feature of life in the Brazilian capital. The limousine is the most popular car, with the largest touring car next in favor, while the sedan predominates among the smaller machines. Even for business, the Brizilian business man prefers the limousine or the touring car to the runabout, and the public does not care for taxicabs, so that there are comparatively few in use in Rio, or, in fact, in any of the larger cities of the country. The broad, smooth avenues are admirably adapted to the use of autos, and, as there are no speed restrictions the one great object of the native driver is to see how fast he can go, either the city or in the suburbs. Carefulness of pedestrians alone prevents scores of serious accidents daily, as the drivers are not compelled to stop, or even to slow down, for the people to cross the streets."

MAKE PATENT TUBE

MILWAUKEE, Wis., Nov. 17.—The Tomah Rubber Works, incorporated in Milwaukee with $100,000 capital stock, will establish a plant in Tomah, Wis., for the manufacture of a special type of inner tube for pneumatic tires, equipped with a patented alarm device which gives a signal when the air pressure is reduced to a certain point by puncture or blowout.

France Standardizes Solid Tire Bands

PARIS, Oct. 20—(Staff Correspondence.)—Base bands for solid tires have been standardized in France, the following being the dimensions, in millimeters, that have been adopted, tires corresponding to base bands of standardized dimensions:

Interior diameter of base band	Section of Tires 100	120	140	160	180
720	870	900	900	900	...
770	920	930	950	970	970
850	1,000	1,010	1,000	1,030	1,030
1,000	1,140	1,160	1,000	1,030	1,030

GOVERNMENT RAISES GASOLINE STANDARD

New Specifications Fix Degree Points for Supply After Nov. 25

WASHINGTON, Nov. 18—New gasoline specifications for government use have been adopted and will go into effect on Nov. 25.

Under these specifications the end point is raised to 437 deg. Fahr. and the 90 percent point to 374 deg. Fahr. The reading at the 45 percent point is replaced by one at the 50 percent point and raised 9 deg. Fahr.

It has also been decided to eliminate all reference to gravity from all specifications for lubricating oil.

The revised specifications for motor gasoline and the procedure and details of manipulation in conducting distillations are given in the report of the Committee on Standardization of Petroleum Specifications, Bulletin No. 3, which has just been issued by the Bureau of Mines, Washington, D. C.

Specialists to Search Out Alloy Properties

WASHINGTON, Nov. 19—The Division of Industrial Research of the National Research Council is arranging for the formation of a co-operative association to plan and support fundamental researches in alloys. Although much valuable work has been done in this field by scattered investigators, there is no doubt that a well-planned and co-ordinated effort by a co-operative association working under the general guidance of the National Research Council and composed of specialists representing both the manufacturers and the more extensive users of alloys can produce additional results of great importance. The success of other industries which have supported research on a co-operative plan, such as has been done by the National Canners' Association and the Malleable Iron Manufacturers, is evidence of this.

It is planned to create a special scientific staff composed of a director and assistant director of research and a group of scientific investigators and technical experts who shall give their whole time to the work. To finance the organization each member of the co-operative association will pay $1,000 a year, and all contributing members, who may be either alloy manufacturing or using individuals, firms or companies, are to benefit alike by the results of the researches.

New Postal Plane in Successful Flight

WASHINGTON, Nov. 15—The twin-engine De Haviland airplane reconstructed by the Postoffice Department especially for air mail service made its initial flight today from New York to Washington and was found satisfactory. The trial demonstrated that the arrangement surpasses the service of the single engine slight increase in speed, doubling the machine now in general use, giving a carrying capacity to 800 pounds of mail and increasing the protection of the pilot and the plane against fire by approximately 80 per cent. Other De Haviland planes now in stock will be reconstructed and mounted with twin engines and other special features.

The airplane carried an engine on each wing, slightly removed from the center cockpit. Each engine controlled a propeller revolving forward of the driver. The single machine De Haviland has its engine located in the fore of the ship, directly in front of the pilot. While the former isolates the engines from the gasoline tanks, the latter does not. Thus the fire danger is minimized in the plane in question.

The speed of the twin-engine De Haviland is from 110 to 115 miles an hour. It runs on both engines or on one in the event that one engine goes out of commission. The speed on but one engine is about 85 miles an hour.

This feature is notable as it gives assurance of further safety in the air in case accident or engine trouble should be met while in flight.

The twin-engine De Haviland arriving today was loaded up to 600 pounds, but it is said to be capable of carrying 1,000 pounds of mail. The normal load of the single engine De Haviland is about 400 pounds.

Big Depreciation in Motor Stocks Shown

NEW YORK, Nov. 15—A total depreciation of $253,131,226 in the market value of minor motor stocks in the low prices touched last Thursday is shown in a recent article in The Wall Street Journal. These figures are based on the outstanding share capitalization of each issue.

Of this shrinkage $186,892,373 is accounted for in the decline of 126½ points in General Motors. This is more than the total decrease in market valuation of the other eight issues combined.

Willys-Overland declined only 10¼ points from its high this year, but it has 1,664,835 shares outstanding, bringing the actual reduction in its market value to more than $17,000,000. Studebaker's decline of 42½ points is equal to $12,675,000, and White's drop of 25½ points amounts to more than $10,000,000 compared with that of a month ago.

The following table shows this year's high price of nine representative automobile stocks and the lows touched Thursday, as printed in the Wall Street Journal:

	1919 High	Thurs. Low	Dec.	Market Val. Shrinkage
General Motors	406½	280	126½	$186,892,372
Chandler	141¼	104¾	36½	7,655,000
Maxwell 1st pfd	84½	68	15½	2,067,173
Maxwell common	61	39	22	2,817,122
Pierce Arrow	99	60½	38½	9,625,000
Studebaker	151	108¾	42¼	12,675,000
Stutz	144⅞	103⅝	41¼	4,125,000
White	86	60½	25½	10,200,000
Willys-Overland	40¼	30	10¼	17,064,559
Total				$253,131,226

Congress to Consider Federal Highway Bill

WASHINGTON, Nov. 13—It is now expected that the Federal Highway Bill introduced in Congress by Senator Townsend and which will provide for a Federal Highway Commission to control all governmental highway activities will not be brought before Congress until late in December. The delay is due to congressional attention to such important questions as the Peace Treaty, League of Nations and railroad legislation. However, in the meantime the Committee on Postoffices and Post Roads is taking up the measure and will hold hearings on it in the near future and put the bill in its final form to be presented to the Senate.

The purpose of the bill is to take care of interstate traffic, to serve the large centers of commerce in each state, to meet the military needs of the country and to tie the country together in a unit so that it will be possible for the states to plan and connect their highway systems with the national highway system and thus link all of the important commercial centers by highways.

"The counties would then connect with the state system and build out from the centers of population into the farming communities like the spokes of a wheel, forming a road plan that would do the largest number of people the greatest good. Each unit would be made more effective and efficient and the farmer would be given a number of markets instead of one for his produce.

"This road plan would greatly reduce the cost of transportation and lower the cost of living to the consumer. In other words, the national highway system would form the backbone of the main commercial arteries of the nation and greatly stimulate the states to connect up their systems with the national system, as well as the counties to connect with the state system, thereby making a general road plan that would effectively meet the road needs of the country; a plan that could be brought about and built in the shortest time at the least possible cost, and one that would be of the greatest value to all the people.

CHARTER AUTO TOP CO.

MILWAUKEE, Wis., Nov. 17.—A charter has been granted to the National Auto Top Co., Milwaukee. The capital stock is $10,000 and the objects to manufacture and deal in tops, cabs, trimming, etc. The incorporators are Mrs. Rose Eder, Mrs. H. Goldmann and Mrs. Harry Eder.

Henderson Tire Opens New York Sales Office

NEW YORK, Nov. 19—The Henderson Tire & Rubber Co., with factories in Bucyrus and Columbus, Ohio, has opened a general sales office at 40 Exchange Place, New York, in charge of H. W. Harwell, manager, who has been identified with the automobile industry for more than 14 years.

The fabric tires manufactured by this concern are made in metric and inch sizes. Henderson cord tires will be on the market shortly.

The Bucyrus factory is now turning out 900 tires a day. A new factory at Columbus, which was to be in operation on Nov. 15, has a daily capacity of 2,500, and a new unit of the Columbus factory now under way will increase the capacity 2,000 additional a day.

The opening of the New York sales office marks the step of the Henderson company toward direct sale of their products. Heretofore the products have been sold through various agencies.

C. O. Henderson, president of the concern, has been a tire builder for 18 years.

NEW AJAX CLUBHOUSE

RACINE, Wis., Nov. 17.—The Racine Rubber Co., Racine, Wis., western division of the Ajax Rubber Co., New York, has presented its employes, organized as the Racine Rubber Co. Welfare Association, a beautiful clubhouse for their exclusive use. The clubhouse is located directly across the street from the main works and offices and represents an investment estimated at about $20,000. The company also has engaged in a large housing program to facilitate the enlargement of its payroll to man factory extensions now under way which will increase the capacity by more than 100 per cent.

MAKES 400,000TH CAR

DETROIT, Nov. 15.—Dodge Brothers Motor Car Co., established a record in the automobile industry when its 400,000 car rolled from the assembling line to the test track for inspection, marking a bona-fide delivery of 400,000 cars during the first five years of the company's history. The first car was delivered Dec. 4, 1914, at which time the plant covered 20 acres. Today the factory covers 90 acres with 18,000 names on the company's payroll. Car No. 400,000, a four-door Sedan was allotted to Thomas J. Doyle, Dodge dealer in this city.

NOVEL COURT VIEWS

LONDON, Oct. 24.—The High Court has given decision this week placing a motor-assisted pedal-cycle in the same legal category as a motor car, and therefore to be fitted with number plates, and registered, and taxed like motor vehicles. A still more curious anomaly in British law is that a recent decision places a small battery-electric invalid runabout in the category of steam traction engines which have to be preceded by a man walking with a red flag. Motor law reform is long overdue here. The present act came into effect in 1907. Many attempts have been made to amend it, but always ineffectively.

Men of the Industry

Changes in Personnel and Position

GARFORD DENIES RUMOR

NEW YORK, N. Y., Nov. 17.—Recently press items have stated that John N. Willys of The Willys-Overland Co., owns control of The Garford Motor Truck Co., Lima, Ohio, one of the leading motor truck manufacturers of the country.

The Garford Motor Truck Co. gives out a statement that these rumors are unfounded. They advise that neither John N. Willys, nor the Willys-Overland Co. is financially interested in the Garford Company.

Philip H. Lang, who a year ago was promoted from Pittsburgh branch manager to New York branch manager for the Empire Rubber & Tire Co., Trenton, N. J., has been made district manager. He has been with the Empire company for several years.

J. M. Stockfisch, formerly associated with the manufacturers of Veedol Oil, has been made Chicago district sales representative for the National Wire Wheel Works, Inc., Hagerstown, Md.

Grant C. Nicol, who has been identified with the automobile industry in Chicago for a number of years, has been announced by E. A. Williams, Jr., president of the Garford Motor Truck Co., as manager of the Garford branch in Chicago.

N. B. Keller, New Orleans branch manager of the Bearings Service Company, has been promoted to supervisor of distributors and field agents for the same company, and will be located at Detroit headquarters. Keller had been in charge of the New Orleans office 18 months. He will be succeeded by W. O. Hanson, connected with the Minneapolis branch of the company.

Henry M. Shanley has been appointed retail salesmanager for Johnson Bros. Inc., western Massachusetts distributors of International Motor Trucks and Auburn Beauty 6 passenger cars. Shanley formerly was with the Williams Motor Sales Co.

P. C. Massie assumed the Chicago district for the Oldfield Tire Co., of Cleveland, on Nov. 15. Massie was located formerly in the Pacific Coast district, with offices in San Francisco. He will be succeeded there by R. R. Colby, formerly of the Los Angeles office.

BUSH OFFICES OPEN

CHICAGO, Nov. 17.—The Bush Manufacturing Co., Bush Temple, 800 North Clark street, has opened offices to deal in automotive equipment, and is prepared to represent manufacturers in Chicago and the vicinity.

FORDS GET WATER RIGHTS

DETROIT, Nov. 17.—Henry Ford & Son, have taken possession of the plant of the Union Manufacturing Co., in Northville, and work of remodeling the building has started. The new factory will be used in the manufacture of piston rings for Fordson tractors according to present plans. The company also has purchased the power dam and water rights of the American Bell & Foundry Co., the property of the Northville Milling Co., and the Dubuar Lumber Co., property in Northville.

NAME CAMERON OFFICERS

NEW YORK, Nov. 17.—Officials of the Cameron Motors Corp. who took office Nov. 3 have been announced. Everett S. Cameron, of West Haven, Conn., is president; Leslie W. Holmes, Shelton, Conn., vice-president and general manager; Pierpont B. Foster, New Haven, Conn., treasurer; Albert C. White, West Haven, Conn., production manager; Harry W. Doherty, New York, director of sales; F. S. Young, Fostoria, O., and V. C. Morris, New York, directors, the board of directors consisting of the seven men named.

NEW SOUTHERN JOBBERS

ATLANTA, Ga., Nov. 17.—Bailey & Co., jobbers here, have incorporated a new company in Arkansas known as Bailey & Company of Arkansas, Inc. The company will conduct a general jobbing business in automotive supplies at 100-1002 West Markham street, Little Rock. This company will supply Arkansas, Oklahoma, and Texas territory.

The new firm has been capitalized at $40,000 with the following officers: Al H. Bailey, president; Earl R. Hardwick, vice-president; R. D. Fenton, Jr., secretary and treasurer.

SPEEDS EXPORT TRADE

MILWAUKEE, Wis., Nov. 17.—The Bobroff Foreign Trading & Engineering Corp., Milwaukee, has been incorporated with a capital stock of $125,000 by a number of Milwaukee manufacturers for the purpose of facilitating export transactions. B. L. Bobroff, a well known mechanical engineer and inventor of electrical devices, is president. Other members include Edward H. A. Schroeder, of the Milwaukee Shaper Co.; Peter Lowe, sales manager, Kempsmith Mfg. Co., and Fred G. Simmons, consulting engineer.

ENGINEMAN EXAMS.

NEW YORK, Nov. 18.—The municipal Civil Service Commission of New York has announced an examination for the position of automobile enginemen. Applications will be received at the municipal building until Dec. 4.

Candidates must be at least twenty-one, citizens, residents of New York state, and must show recent experience of at least one year in the operation of motor vehicles. The salary is $960 to $1,200 a year.

SALES COMPANIES FORMED

CLEVELAND, O., Nov. 17.—The Brook-Motor Sales Co., has been chartered with a capital of $50,000 by A. E. Literaty, Alois Sperling, Frank Legesnary, John Sperling and Anna Sperling.

Bethlehem Motors to Have 8,000 Output

NEW YORK, Nov. 19—An annual output of more than 8,000 trucks a year is predicted for the Bethlehem Motors Corp., of Allentown, Pa., as the result of the sale of 43,000 shares of new stock which is to be offered to the stockholders for subscription at $28 a share, and from which the corporation expects to receive about $1,000,000.

The present plant is capable of considerable expansion, and it is not believed that it will be necessary to erect additional units to meet the enlarged program. At present the Bethlehem Motors is turning out trucks at an annual rate of between 3,500 and 4,500.

Unfilled orders on the books for more than 3,000 trucks are reported. This alone will keep the company busy for some time. The net earnings after all charges and federal taxes are in the vicinity of $1,000,000 a year, equivalent to nearly $8 a share on the 130,000 shares now outstanding.

CANADIAN DODGE PLANT

ST. THOMAS, Ont., Nov. 18.—It has been announced that Dodge Bros. Ltd., will shortly open a plant in this city. The company's officials came to St. Thomas a year ago and met the Board of Trade. They had at that time practically decided to locate in the town, but the condition of the streets prevented them from doing so, their claim being that in order to run a factory successfully, there must be a series of well paved streets.

TO BUY GUN PLANT

MILWAUKEE, Wis., Nov. 17.—The Cutler-Hammer Mfg. Co., Milwaukee, manufacturer of electric control devices, including automotive switches, etc., is reported to be negotiating for the purchase from the Government of the plant of the Wisconsin Gun Co. in Milwaukee, erected early in the war period to produce 75 mm. field pieces. The plant represents an investment of about $3,250,000, and was financed by representatives of five large foundry and machine shop concerns of Milwaukee. It has been idle for several months. The plant is regarded as one of the finest and most efficient machine shops in existence.

TRUCK CO. INVADES RESORT

MT. CLEMENS, Mich., Nov. 15.—The Reynolds Motor Truck Co., latest addition to the industrial development of Mt. Clemens, will erect a modern factory and office building adjoining that of the Superior Steel Spring Co., which will furnish the springs. The Mt. Clemens Truck Body Co. will furnish the bodies and cabs. The company will bebin the manufacture of trucks in a temporary building in about two weeks.

ENLARGE CASTING PLANT

LANSING, Mich., Nov. 14.—The Standard Casting Co., has leased a building adjoining its present plant and will construct an addition that will permit of a 50 percent increased output. The company is confining its work to contracts with the Reo Motor Car Co., and two other local concerns.

Current News of Factories

Notes of New Plants—Old Ones Enlarged

NEW ESSEX PLANT OPEN

DETROIT, Nov. 18—Essex production has been removed from the main Hudson factory and is housed in a new $1,220,000 assembly unit, just completed and which was to begin operation Nov. 15. The new plant marks the completion of the first unit in the proposed $2,250,000 Hudson-Essex expansion plan, which includes a machine shop and heat-treatment plant, nearing completion at a cost of $750,000. A large building erected during the war for shell manufacture also will be used for production work. All of the new plants will be in operation soon after Jan. 1.

The ground occupied by the additions covers 42 acres, in addition to the 26 acres occupied by the main factory. The machine shop will be 300 by 400 feet with 120,000 square feet of floor space. The heat-treatment plant will be 100 by 200 and will have 20,000 square feet of floor space. The present force of 6,000 employes will be doubled when the extensions are completed.

Essex Motors Co., terminated its 1919 productions schedule when its 20,000th engine was turned out Oct. 27, six weeks ahead of schedule, a record regarded as remarkable by engineers. A big factor in making the production record possible was the fact that $450,000 worth of aircraft machinery, delivery of which was cancelled after the armistice, was purchased by Hudson-Essex and put in place and in operation last Jan. 15. The 1920 program calls for 40,000 Essex cars and 30,000 of the Super-Six design.

FINANCES PLANT GROWTH

MILWAUKEE, Wis. Nov. 17.—The Briggs & Stratton Co. Milwaukee, has increased its authorized capital stock from $250,000 to $1,700,000. The new issue, which already has been subscribed, will be used largely for the financing of plant extensions and new equipment now being made and projected for 1920, which will increase the capacity about 250 per cent. The company manufactures gas engine ignition specialties, parts, automotive equipment, and a motor-wheel appliance for bicycles, a new department acquired some time ago from the A. O. Smith Corp., Milwaukee.

DETROIT PLANT CHANGES

DETROIT, Nov. 15.—E. R. Little Co., Inc., has taken over the business of Little & Shepherd, engineers, and will continue in the work of mechanical engineering, specializing in power and heating plant design and operation.

TO MAKE PISTON RINGS

PROVIDENCE, Nov. 18.—Linden & Co., 136 Clifford street, Providence, has entered the field as manufacturer of piston rings.

NEW FIRMS INCORPORATE

WILMINGTON, Del., Nov. 17.—The following charters have been issued under the laws of Delaware, but beyond that fact no information is obtainable here concerning their plans:

Carlisle Tire Corp., of New York, with a capital of $33,000,000, to manufacture tires, casings, etc. The incorporators are J. S. Britz, Hans V. Breiser and Edwin M. Simpson, of New York.

Lorraine Motors Corp., of Grand Haven, Mich., with a capital of $31,500,000, to manufacture automobiles and parts. The incorporators are J. F. Johnston, Garrett L. Dornbos and J. L. Dornbos, of Grand Haven.

Supreme Motors Corp., of Dover, Del., with a capital of $2,000,000, to manufacture and sell motors, etc. The incorporators are William N. Lofland, Frank Jackson and Mark W. Cole, of Dover.

Kentucky Tire and Rubber Association of Louisville, with a capital of $1,000,000, to manufacture rubber tires, tubes, etc. The incorporators are W. R. White, L. C. Evans and D. W. Boner, of Louisville.

Paramount Rubber Consolidated, Inc., with a capital of $6,000,000 to manufacture, purchase, prepare for market and dispose of rubber automobile shoes, tubes, etc. The incorporators are T. L. Croteau, P. B. Drew and H. E. Knox, of Wilmington.

Motor Car Specialty Co., of Wilmington, with a capital of $100,000, to manufacture automobiles and automobile specialties. The incorporators are J. M. Frere of Wilmington and J. A. Frere and G. J. Foran of Newark, N. J.

The Fry Rubber Co., of New York, has filed a certificate increasing its capital stock from $500,000 to $700,000.

MASON TIRE BUILDS MILL

NEW YORK, Nov. 18.—The third expansion in three years is announced by the Mason Tire & Rubber Co., Kent, O. The most important feature of this expansion is the erection of the $2,000 000 Mason cotton fabric mill, the first fabric mill to be built in the Akron district. The first unit of 10,000 spindles is expected to be in operation in a few months. Large shipments of Egyptian cotton are now enroute from Alexandria for the initial weave.

Housing of the large increase of workers brought to Kent by the tire fabric mill and the enlarged rubber plant is provided for by the purchase of 140 acres of land for improvement, in addition to a large number of houses built during the past year.

U. S. WILL BUY PLANTS

WASHINGTON, Nov. 12.—Final decision to recommend purchase by the Government of the Dayton-Wright plant and adjacent aviation fields at Dayton, and the Curtiss-Elmwood plant, Buffalo, was reached yesterday by the House military subcommittee, authorized by the full committee, to pass finally on the War Department's request for sanction to acquire the two properties.

Representative Anthony of Kansas, chairman, said the Dayton property would cost $2,700,000 and the Buffalo property $1,800,000 in addition to larger sums already expended by the Government.

Calendar

SHOWS

Nov. 16-23—New York Automobile Salon, Hotel Commodore.

January—New York. International Automobile Mfrs.' Congress.

Jan. 3-10—New York, N. Y. Grand Central Palace, National Automobile Chamber of Commerce. S. A. Miles, Manager.

Jan. 3-10—New York City. Eighth Coast Artillery Armory, commercial cars and accessories.

Jan. 8—Chicago. Airplanes. Manufacturers' Aircraft Association. Congress Hotel.

Jan. 17-21—Cleveland. Nineteenth Annual Automobile Show, Cleveland Automobile Mfrs.' and Dealers' Assn., Wigmore Coliseum.

Jan. 24-31—Chicago, Ill. Coliseum. Cars: Drexel Pavilion. National Automobile Chamber of Commerce. S. A. Miles, Manager.

Jan. 24-31—Chicago. International Amphitheater, commercial cars and accessories.

Jan. 31-Feb. 6 — Kansas City, Mo. Annual exhibition, Overland Bldg. E. E. Peake, Manager.

Feb. 2-7—Toledo, Ohio. Annual Automobile Show, Terminal Auditorium.

Feb. 9-14—Nashville, Tenn. Nashville Automobile Trade Association.

Feb. 21-28—Ottawa, Ont. Motor Show.

Feb. 23-28—Louisville, Ky. Twelfth annual exhibition, Louisville Automobile Dealers' Assn., First Regiment Armory.

February—Chicago. International Automobile Mfrs" Congress.

February—Deadwood, S. D. Annual Show, Deadwood Business Club. F. R. Baldwin, Manager.

March 13-20—Boston, Mass. Annual Automobile Show. Mechanics' Building.

FOREIGN SHOWS

November—Christchurch, N. Z. First National Motor.

December—Brussels, International Automobile Mfrs.' Congress.

Dec. 1-9Jan. 4—International Aviation Exhibition, Paris, France.

January—Glasgow, Scotland Scottish Motor Exhibition.

February — Manchester, England. North of England Motor Exhibition.

Feb. 22-March 6 — Birmingham, Eng. British Industries Fair.

March—London, Eng. Motor Boat Marine and Stationary Engine Exhibition.

March—Adelaide, Australia. All Australian Exhibition of motor vehicles, airplanes, engines and automotive equipment.

March 1-15—Lyons, France. Automotive Products. Lyons Industrial Fair.

April or May—London, Eng. Commercial Vehicles Exhibition, Olympia.

April 3-May 4—Buenos Aires. Exposition of U. S. manufactures.

TRACTOR SHOWS

Nov. 22-29 — Jacksonville, Fla. Florida State Fair and Exposition. B. K. Hanafourde, Manager.

Feb. 9-14—Kansas City, Mo. Fifth Annual Kansas City Tractor Club. Guy H. Hall, Manager.

Feb. 9-14—Wichita, Kan. Tractor and Farm Machinery, Forum, Wichita Thresher-Tractor Club.

CONTESTS

Nov. 27—Los Angeles, Cal. Ascot Speedway race.

Dec. 29—Los Angeles, Cal. Ascot Speedway race.

August, 1920 — Paris, France. Grand Prix Race, Sporting Commission. Automobile Club of France.

CONVENTIONS

November — London, Eng. Road Transport Congress and Exhibition.

Dec. 3-5—Cleveland, Ohio Automobile Trade Assn. annual convention.
American conference.

Feb. 9-13—Louisville, Ky. Seventeenth Annual Convention American Road Builders' Assn., Tenth American Good Roads Congress and Eleventh National Good Roads Show.

May 15-20, 1920—San Francisco. Seventh National Foreign Trade Convention.

Rice Growers Turn to Tractors in Far East

WASHINGTON, Nov. 15—Interest in farm tractors is growing in the Far East, according to a report received by the Department of Commerce from Consul G. L. Logan, with the increasing planting of rice, which is selling at high prices and allowing planters to make investments.

"When the price of rice advanced to an almost impossible figure," reported Consul Logan, "the Government, in an effort to provide against a similar condition in the future, required estate managers to plant a certain proportion of their land in rice and other foodstuffs.

"Immigration was restricted because of the difficult food situation, while at the same time there was considerable emigration of laborers, causing a shortage in British Malaya.

"Planters began to think of labor-saving machinery as a solution of their difficulties. Rubber and cocoanut plantations afford a good opportunity for using tractor and harvesting machinery between the trees, as they are spaced 20 to 30 ft. apart, especially if it is found practical to grow rice between the trees on young plantations, until the shade becomes too dense.

"This seems to be a most opportune time for the introduction of tractors and modern cultivators. Personal representation is the most effective way of establishing relations with the large importing houses. A method of promoting sales which has much to commend it and which has been adopted by some American exporters and manufacturers, is to assign an experienced man to a local import house to work under the joint direction of his principal and the importer. The granting of an exclusive agency for a definite territory to a progressive firm with good distributing connections, and judicious advertising support, also gives good results. Other American houses whose goods are enjoying a ready sale reach the buying public through advertisements in local papers, as a large part of the business in the Malay peninsula, Southern Siam and Sumatra is done by mail.

Trollyless Toledo Buys Light Cars

TOLEDO, O., Nov. 15—Automobile dealers in this city are reaping a harvest as a result of the action of the street railway company in removing its cars to Michigan following a vote of Toledo residents ousting the company. An increase of more than 100 per cent in the sale of light cars of the less expensive type is reported. Gasoline consumption has increased over 300 per cent. Local automobile factories are devoting practically all of their output to Toledo in an effort to overcome the emergency and hundreds of "jitney" lines are supplemented by private cars, owners of which are showing a true civic spirit in carrying out the "give 'em a lift" idea.

Trade Classification Delayed Temporarily

WASHINGTON, Nov. 17—Final revision of the new import and export classification is now in progress, but will not be completed in time for the schedule to be put into effect next January. As has been announced in commerce reports from time to time, the Bureau of Foreign and Domestic Commerce, in collaboration with other government offices, has been engaged for the last year in drawing up this classification. A practically complete first draft was submitted by the Interdepartmental Statistical Committee, of which Dr. G. B. Roorbach, formerly of the United States Shipping Board, was chairman, and was approved in principle and in substance by the Secretary of Commerce.

The main object is to make the official statistics of imports and exports meet as fully as possible the industrial and commercial needs of the country. The success of the work is due largely to the ready co-operation of many of the leading trade associations, technical experts and individual business men, to whom the cordial thanks of the bureau are extended.

The new schedule will be printed as soon as final revision now in progress can be completed, so as to give ample time for American consuls, importers, exporters, and customs officials to become thoroughly familiar with the new requirements before they are put in force on Jan. 1, 1921.